SUPPORT FOR THE NONINSTITUTIONALIZED FUNCTIONALLY LIMITED ELDERLY: AGE-LINKED DISSIMILARITIES IN THE CAREGIVING NETWORK

By

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A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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To my grandparents,

Warren T. Dwyer
(1908 - 1984)

Evelyn S. Dwyer
(1910 - 1979)

Claude L. Wood
(1901 - 1974)

L. Velma Wood
(1904 -)

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Rapidly increasing numbers of functionally limited elderly persons and escalating health care costs have prompted renewed interest in family-based community care as an alternative to institutionalization. This study utilizes a matched sample of 1387 noninstitutionalized functionally limited elderly persons and their primary caregivers drawn from the 1982 National Long-Term Care Survey and National Survey of Informal Caregivers. The purpose is to determine whether there are differences in caregiving related variables by age of the care-receiver and to test a comprehensive model of the caregiving network that explains increased functional impairment and caregiver stress/burden, the primary antecedents to institutionalization. After testing and rejecting the equality of covariance matrices hypothesis, the model of the caregiving

network is fit to three age stratified groups of functionally limited elderly persons.

Based on the assertion that family systems and bureaucracies can best be served through balanced cooperation, the theoretical model has three major caregiving components: the primary caregiver, the formal support network, and the informal support network. Chi-square and analysis of variance analyses show that caregiving related variables differ by age of the care-receiver. The estimation of a simultaneous system of equations indicates that the theoretical model does adequately represent the sample data. Moreover, when the model is fit to three age stratified samples, relationships between components of the caregiving network vary substantially by age of the care-receiver.

Specific findings suggest that household income has a significant impact on the caregiving network only when the care-receiver is 65 to 74 and that many primary caregivers care for two functionally limited elderly persons. Moreover, paid helpers may have the potential to provide for specific functional impairments and the 75 to 84 age cohort warrants special attention. These results suggest that functionally limited elderly persons should be treated as a heterogenous rather than a homogeneous group in future research.

CHAPTER ONE
INTRODUCTION

Long-term care for the elderly is one of the most difficult and important social problems facing America today. Economic analyses suggest that family-based community care is less expensive than institutionalization for all but the most severely impaired elderly (Comptroller General, 1977). Consequently, the provision of care by family members is of particular interest to policymakers. At the same time the 85 and older population, the most likely to be functionally impaired, has become the fastest growing segment of the population. The demands placed on potential caregivers as a result of increased labor force participation, marital disruption and other social changes have also increased. Hence, families will be expected to furnish more care to an increasingly impaired elderly population at a time when their physical, economic, and emotional capacity for caregiving is likely to decline.

In recent years the heterogeneity among family caregivers and the difficulties associated with particular types of caregiving situations have gained recognition among family gerontologists (Cantor, 1983; Soldo and Myllylouma, 1983). Yet, many issues related to caregiving are still underresearched. Clark and Rakowski (1983)

suggest that one important area of research is defining the stages of caregiving. Sangl argues that more research is needed to "determine the conditions and circumstances under which members of varied family networks at different life cycle stages are willing to care for the elderly" (1985, p.330). This is especially important given the diverse structure of American families. Commensurate with diverse research agendas, intervention strategies need to be targeted to particular types of primary caregivers and the household context within which caregiving occurs (Noelker and Wallace, 1985). Two important areas of caregiving research not addressed in the literature are a theoretical model for explaining the complex relationships inherent in caregiving and the delineation of differences in the content of the caregiving network by age of the care-receiver.

Cantor (1983, p.597) asserts that "the homogenization of such crucial variables as type of relationship, sex, age, health, and work status of caregivers" obscures differences among various types and the problems they face. The treatment of caregiving related factors as undifferentiated by age, sex, and type of relationship underscores the atheoretical nature of most caregiving research. Nearly all existing research focuses on narrowly defined concepts and bivariate causal relationships, with limited theoretical insight. The development of a model of caregiving is necessary to understand more thoroughly the

complex of relationships associated with caregiving and their influence on antecedents to institutionalization. Once a model of caregiving is derived from the literature and fit to the data, it can be utilized to test the extent to which caregiving networks of age stratified samples of impaired elderly persons are homogeneous.

Streib (1983) argues that the frail elderly have been neglected in sociological research. This is especially true with respect to caregiving. Although age related differences in factors such as marital status and functional impairment have frequently been noted, little has been done to differentiate between the "young-old" and the "old-old" in a more comprehensive fashion. Inasmuch as demographic changes, rising long-term care costs, and the declining pool of potential caregivers have differential effects based on age of the care-receiver, research, policies and intervention strategies can be oriented toward distinct age-specific populations. To date, research has not specifically addressed differences in the caregiving network by age of the care-receiver.

The present research has two objectives. First, a model of caregiving that explains differences in antecedents to institutionalization will be proposed and fit to a population of functionally impaired elderly persons. Increased functional impairment among the elderly and caregiver stress/burden are the most frequently cited precursors to institutionalization. Second, a revised

model of caregiving will be fit to three age stratified groups of noninstitutionalized functionally limited elderly. The goodness-of-fit of this model to each of the age stratified elderly samples will be empirically tested. The purpose is to identify, by age of the care-receiver, the extent to which caregiving components facilitate the explanation of functional impairment and caregiver stress/ burden. These findings will contribute to existing research by formalizing a comprehensive model of caregiving and directly addressing the heterogeneity of caregiving relationships.

Caregiving

A recent government report on caregiving asserts that there has been a resurgence of interest in familial responsibility for the care of the aged in the 1980's (Select Committee on Aging, 1987a). Caring for a dependent elderly parent has become a normative but stressful experience, one which may exceed the capacities of many families and about which the consequences are little known (Brody, 1985). Marital disruption, labor force participation, lack of economic resources, and a deterioration in health status may limit the ability of a potential caregiver to provide sufficient care (Masnick and Bane, 1980; Select Committee on Aging, 1987a). Nevertheless, elderly persons with family support enter nursing homes at levels of functional impairment exceeding

those without such informal care (Barney, 1977; Dunlop, 1980). Recent studies suggest that a spouse or household member may be the critical factor in maintaining noninstitutionalization as the care-receiver's health declines.

Institutionalization is most frequently associated with increased functional disability and the loss or absence of informal family support (Lave, 1985). The loss of family support is usually linked to stress brought on not only by the elderly person's impaired status, but by other changes in the lives of potential caregivers. Barney (1977) found that the need for general assistance with activities of daily living was the most useful factor in predicting nursing home admission. In a study of mental impairment, nursing home placement was related to the caregiver's perceived burden rather than the severity of dementia of the care-receiver (Zarit et al., 1980). Potential long-term care patients and their families draw on a variety of resources in an effort to forestall nursing home placement.

Demographics

The elderly constitute the fastest growing segment of the United States' population. Estimates by the Census Bureau indicate that the 29 million people age 65 and over today will expand to 65 million by the year 2030, when the core of the baby boom generation reaches retirement age, and 73 million by 2050. Moreover, the very old, those 85 and older, will increase from 2.7 million today to 8.6

million in 2030 and 16 million in 2050. In the year 2050, 20 percent of Americans will be 65 or older and 5.8 percent will be 85 or older. The comparable figures today are 12 percent and 1.1 percent (U.S. Bureau of the Census, 1984).

The number of elderly persons requiring long-term care will increase even more rapidly than the population at large. Of the 6.5 million elderly currently in need of long-term care, approximately 4.25 million are moderately impaired, 850,000 reside in the community with severe limitations and 1.4 million are in nursing homes (Liu et al., 1985; Macken, 1985). One projection suggests that the long-term care population will increase from 6.5 million today to 19 million in 2040 (U.S. Senate Special Committee on Aging, 1985).

Economics

In 1984, the elderly population accounted for 31 percent of total personal health care expenditures. Between 1960 and 1982 the public share of these expenditures rose from 28 to 55 percent, with the greatest growth attributed to nursing home care (U.S. Senate Special Committee on Aging, 1986). By 1984, $10.4 billion or 68 percent of the Medicaid budget was expended on institutional care, with $31.4 billion spent in all (Waldo and Lazenby, 1984). Soldo (1980) asserts that 135 to 200 government programs affect the elderly by providing direct services, or making available cash and in-kind assistance.

These programs, administered by the federal government and intended to ease the burden of elderly care, accounted for $155 billion in expenditures in fiscal year 1980 (Soldo, 1980). Taking into account present benefit structures and population projections, vast resources will be necessary to provide health care to the elderly by the early part of the next century (Binstock, 1985).

The funding of long-term care by the elderly and their families has also risen since legislation for Medicaid and Medicare was passed nearly a quarter of a century ago. Despite expenditures of $71 billion for Medicare (up from $1 billion in 1965) and $42 billion for Medicaid in 1985, out-of-pocket expenses for health care by the elderly will soon exceed the proportion of total income spent prior to the inception of these programs (Arnett et al., 1986). Moreover, as costs borne by the formal sector rise, the value of informal services increases as well. Transfers related to caregiving within the family were calculated at $709 billion in 1979, equivalent to 30 percent of the gross national product (Morgan, 1983).

Policies

The escalating costs of long-term care, coupled with the growing elderly population, have stimulated a renewed interest in maintaining disabled elders in the community. Many believe that coordinated delivery of home-based services to assist families in caring for the elderly is

the answer to the financial dilemma posed by future long-term care needs (Osterbusch et al., 1986; Lave, 1985). However, these recommendations are made with cost containment in mind, rather than the ability of families to provide such care. There is evidence that budget restrictions imposed by the Office of Management and Budget on programs for the elderly are based on the assumption that new or extended benefits would simply substitute government funds for care currently provided free by relatives and friends (Rich, 1985). Policymakers are advocating private responsibility in meeting the needs of the impaired elderly under the guise of "preserving family ties" (Brody, 1981).

According to Schorr (1968), "the family" benefits from government intervention only when its needs are consistent with those of individuals, are coincidental with the resolution of other social or economic crises, or when action is taken to correct inadvertent changes in family programs caused by the institution of other legislation. Hence, it is not surprising that escalating costs have prompted a change in philosophy within the Health Care Financing Administration regarding the role of the family in long-term care. When Medicaid and Medicare legislation was enacted in 1965, the interpretation was that children could not be required to contribute to the care of their parents nor could their assets be included in determining eligibility. In 1983, however, in response to the

escalating cost of nursing home care, it was ruled that adult family members could be required to contribute to nursing home care received under Medicaid. Since then, many states have begun to enforce family responsibility laws already in existence and 10 to 12 additional states have enacted similar legislation (Lave, 1985).

Plan of Research

It is expected that several fundamental components of the caregiving network can be defined and a comprehensive model of caregiving developed from a review of the literature on caregiving. Moreover, it is anticipated that the relative importance of each factor will vary by age of the care-receiver. In order to address these issues, the ensuing analysis will fit a model of caregiving to a sample of functionally impaired elderly persons 65 and older. Subsequently, this model will be fit to three age stratified groups, those 65 to 74, those 75 to 84, and those 85 and older. To the extent that differences between these age stratified samples are substantiated, this research may demonstrate to academicians and policymakers that a policy of noninstitutionalization for the impaired elderly will require a broad range of services that account for age-linked dissimilarities in the caregiving network.

Chapter two surveys the literature on caregiving. After a brief introduction, household and caregiving economics, primary caregivers, the informal support

network, the formal support network, functional impairment, and caregiver stress/burden are reviewed with special attention given to variation by age of the care-receiver. The conceptual framework developed in chapter three builds on Litwak's (1985) "theory of shared functions." A model of caregiving is posited and explained. The assertion that the impact of various components of this model will differ by age categories when modeling antecedents to caregiving is predicated on the sociological principle that groups can optimally manage those tasks that match them in function.

Chapter four contains a description of the data and the methods of analysis that will be utilized. Data are from the 1982 National Long Term Care Survey and National Survey of Informal Caregivers, the most recent and comprehensive data available. A matched sample of 1387 functionally impaired elderly and their primary caregiver is employed in this analysis. LISREL is the method of choice because it is designed for estimating complex models involving measurement error. In addition, it is designed to handle multiple group comparisons explicitly. Despite the urging of Campbell and Mutran (1982) LISREL has been used infrequently in gerontological research. If unable to construct the unobserved variables necessary for estimating structural equations a system of simultaneous equations will be estimated.

Chapter five includes a description of the impaired elderly and their caregiving network stratified by age

cohort. Descriptive statistics are used to substantiate the heterogeneity of the caregiving population. After determining that the original analysis plan could not be used, chapter six estimates simultaneous equations to fit a model designed to assess the relationship between caregiving components and antecedents to institutionalization among the functionally impaired noninstitutionalized elderly. In chapter seven, this model of caregiving is used to examine differences in three age stratified groups. Finally, chapter eight contains conclusions and suggestions for future policymaking and research.

CHAPTER TWO
CAREGIVING: A REVIEW OF THE LITERATURE

Long-term care connotes an array of medical and support services utilized by elderly individuals who have lost all or a portion of their ability to function unaided due to a chronic condition or illness (Lave, 1985). There is a strong positive correlation between the need for long-term care and age. The percentage of the noninstitutionalized population that requires assistance in accomplishing an activity of daily living increases from .3 percent of those under 25, to 14 percent of those 65 to 74 and 18 percent of those 85 and older (Health Care Financing Administration, 1981). Services to aid the elderly who require medical or other support services ranges from informal care by family members to nursing homes for the most severely impaired. The number of people in nursing homes increases from 12.5 per thousand of those 65 to 74, to 219.4 per thousand of those 85 and older (Kane and Kane, 1987).

That there is a relationship between family care and the institutionalization of the chronically impaired elderly is well established (Townsend, 1965; Barney, 1977; Maddox, 1975; Brody et al., 1978). This relationship is consistent with the assertion of Riley et al. (1972) that age influences a wide range of social phenomena. The

availability of family members to provide caregiving services to an impaired elder is the primary factor in avoiding institutionalization. There are from one to three times as many noninstitutionalized severely impaired elderly persons receiving home-based care due to family involvement as are in institutions. In addition, 60 to 85 percent of the impaired elderly receive help from family members in some significant way (Callahan, 1980). These data serve to show that, contrary to previous reports, institutionalization of the elderly is a last resort after other alternatives are no longer available (Brody, 1977; 1978).

Caregiving refers to care provided to an elderly person with some degree of physical, mental, or emotional impairment which limits independence and necessitates ongoing assistance (Horowitz, 1985). Two myths have been dispelled in recent years regarding the care of the elderly. First, the myth of the isolated elderly no longer has strong support (Aldous, 1987). Families utilize a variety of mechanisms to maintain contact with other family members. Second, the three-generation family, an assumption of many early policies oriented toward care of the elderly, was never as prevalent as our idyllic vision of the past would suggest (Shanas and Streib, 1965). The importance of doing away with these myths cannot be understated. Elderly people generally enjoy frequent contact with their modified extended family, but prefer to

maintain their independence and live with other family members only when absolutely necessary.

Given the multiple demands on families today and the increased needs of the functionally impaired elderly, caregiving is a topic of great importance. This chapter will review literature on caregiving. The first section focuses on household and caregiving economics. It will be argued later that economic factors operate through the caregiving network to impact on functional impairment and caregiver stress/burden. Next will be a discussion of three components of the caregiving network: primary caregivers, the informal support network and the formal support network. Finally, antecedents to institutionalization, functional impairment and caregiver stress/burden, will be addressed. Within each area the focus will be on variations by age within the elderly population.

Household and Caregiving Economics

General improvement in the economic status of the elderly tends to mask dissimilarities that have an impact on caregiving. Unfortunately, summary statistics which treat the elderly as a homogeneous entity are frequently used by government officials and the media to suggest that the elderly have achieved parity with the rest of the population. Seaberry (1985) reported that elderly Americans were no longer a disadvantaged group. Citing figures from the annual report of the President's Council

of Economic Advisors, she reported that per capita family income for the elderly was $9080, compared to $8960 for nonaged families. A closer look shows that the elderly are a heterogenous population with many subgroups facing serious economic difficulties. Prominent among these are the functionally impaired elderly who require the assistance of a caregiver in order to accomplish one or more personal care tasks.

The economic situation faced by functionally impaired individuals over 65 has a tremendous impact on all three components of their caregiving network. The extent to which care is provided by a primary caregiver, the informal network, or the formal network is largely dependent on economic resources. Moreover, income and income-related factors such as health care affect the ability of the caregiving network to tolerate severe impairment and alleviate caregiver stress, thus avoiding institutionalization.

Income

The elderly usually experience a large reduction in income at retirement, but many are prepared to live well with fewer expenses. In 1984, 25 percent of elderly families reported incomes in excess of $30,000 and 11 percent of elderly individuals had incomes of $20,000 or more. At the same time, 20 percent of elderly families reported incomes under $10,000 and 25 percent of elderly

individuals under $5000. Put another way, 21.2 percent of the elderly (5.6 million) were below the near-poverty thresholds of $6224 for a single person and $7853 for a couple (U.S. Bureau of the Census, 1985). Among the functionally impaired elderly, 33 percent have family incomes characterized as poor or near poor, 62 percent report low or middle range incomes and 5 percent high incomes (Stone et al., 1986).

Additional disaggregation of elderly income shows that widows, the very old, and minorities have disproportionately high rates of poverty. In 1983, 36 percent of elderly blacks, 24 percent of unmarried white women and 63 percent of unmarried black women had incomes below the poverty level (Select Committee on Aging, 1986a). These proportions are even more pronounced among the very old. Statistics show that the ratio of elderly blacks to whites in poverty has increased from 1.89 in 1959 to 2.96 in 1984. Although the income of elderly blacks has improved over time, their position relative to whites is even more deprived. This serves to underscore the point that the elderly are a diverse population with a variety of needs (Select Committee on Aging, 1986a).

Markson (1979) characterizes the ethnic elderly as victims of double minority status, facing the difficulties of being both old and nonwhite. For example, there is an inverse relationship between the nonwhite population size and those in institutions. Thus, being nonwhite and poor

are serious obstacles to obtaining adequate institutionalization for the elderly (Kart and Beckham, 1976). Conversely, black elderly persons are often out of necessity more active in the support of other family members. As a result some have argued that the elderly in the black extended family have done very well (Mindel, 1979).

Income is significantly related to caregiving because it influences the degree to which services are provided by sources other than a primary caregiver. The availability of outside resources is important because caregivers, usually women, often sacrifice their own well-being to care for an impaired parent or spouse (Cantor, 1983; Noelker and Wallace, 1985). Low incomes are associated with increased rates of formal service contact and high incomes with more hours of in-home services per week (Bass and Noelker, 1987). Neighbors and Taylor (1985) suggest that low-income persons may use more services as a substitute for facility based care, particularly since they are more likely to benefit from government assistance programs such as Medicaid. On the other hand, the fewer services but more contact hours for the high income elderly may reflect a desire on the part of their caregivers to be relieved of certain obligations.

Health Care

Health care payments for the elderly, nationally, are expected to rise at twice the rate of their income. Through 1991, the price of medical services will climb at a rate of 8.1 percent while elderly income will increase at a rate of 4.0 percent (Arnett et al., 1986). The basic health care package available to the elderly is Medicare. Medicare covers physicians services, hospitalization and medication expenses for those who can afford the yearly premium and deductibles. One percent of the Medicare budget supports nursing home care and 2.5 percent is spent on home health care (Select Committee on Aging, 1987a).

In contrast to Medicare, 68 percent of the Medicaid budget is spent on long-term care in nursing homes, while only 1.7 percent is spent on home health care (Select Committee on Aging, 1987a). Receipt of Medicaid benefits is tied to Supplemental Security Income (SSI) payments for the elderly. In order to be eligible for SSI in Florida, for example, an individual must have an income of $325 per month or less. Nationwide, 14.3 percent of the 23 million low income persons who receive Medicaid benefits are elderly (Detweiler, 1985). The inadequate funding of home health care and contradictory provisions for long-term care under Medicare and Medicaid are not consistent with recent emphases on informal and family caregiving.

The significance of Medicaid in relation to caregiving is twofold: first, Medicaid eligibility for a functionally

impaired elder means that institutionalization is an option; second, many elderly are forced to "spend down" their savings as they become more impaired in order to qualify for Medicaid. These factors are important because they often force a caregiver to continue providing care long after it is reasonable to do so because there is too much money to qualify for formal assistance and not enough to pay for institutionalization privately.

Medicaid was designed in 1965 to provide comprehensive medical care to the poor, not to finance nursing home care. Blame for the failure of Medicaid to sustain benefits to the poor has been placed on the diversion of funds to institutional care (National Study Group on State Medicaid Strategies, 1983). Nevertheless, it has become the most important source of health care payment for those 85 and older (Keigher, 1985).

The family plays a critical role in comparing the costs and benefits of community based versus nursing home care. Bass and Noelker (1987) found that household income was negatively related to service contact, but was strongly related to the amount of service used. They suggest that these findings may be due to the ability of higher-income families to use services later reimbursed by private insurance companies. Liu and Mossey (1980) found that publicly funded nursing home residents had higher levels of functional impairment than residents funded through private sources. Moreover, up to one million people will see their

income drop below the poverty level as a result of paying for health care they or their family members need--two out of three will be elderly (Select Committee on Aging, 1987b).

Inconsistencies, underfunding, and misallocation of health care funds are likely to be exacerbated in the near future. The "out sooner and sicker" phenomenon sparked by the implementation of Diagnostic Related Groupings (DRG's) in hospital care appears to have some basis in fact. Moreover, the 1988 Reagan Administration health care budget called for a reduction in Medicare and Medicaid expenditures of $80 billion (Select Committee on Aging, 1987b). Refinement of the prospective payment DRG system and the repeal of future budget cuts will be just a first step in addressing the health care problems of the impaired elderly and their caregivers.

The household and caregiving economics component consists of three major factors: household income of the elderly, the receipt or non-receipt of Medicaid as a source of health care, and the race of the care-receiver. These variables are important because they constitute three factors frequently mentioned in the literature that impact the functioning of the caregiver network. A low income, receipt of Medicaid, and being black increase the likelihood that formal home-care services will not be available. This means that the primary caregiver and the

informal network will be increasingly relied upon prior to institutionalization.

Primary Caregivers

It has frequently been noted that elderly persons who need assistance in carrying out personal care tasks turn to family members first (Cantor, 1983; Brody, 1981; Soldo and Myllyluoma, 1983). Without this assistance, many more of the chronically ill elderly would be forced out of their homes, some would face institutionalization. Although there are usually family members in the household, children in close proximity, or friends and neighbors willing to provide assistance, primary responsibility is most frequently assumed by one individual (Sangl, 1985).

The relationship between primary caregiver and care-receiver is largely a function of the age of the care-receiver. Impaired elderly 65 to 74 are likely to be cared for by a spouse while adult children generally provide caregiving services to those 75 and older. There typically is a serial ordering in the choice of a primary caregiver. When a spouse is available, he or she is most likely to accept the role of primary caregiver. If a spouse is not present an adult child, usually a daughter, frequently assumes responsibility. Lacking a spouse or an available adult child, other family members may provide care (Johnson, 1983). The unmarried and childless elderly may rely on siblings and other distant relatives. However, the

structure of these relationships is such that they rarely provide a high level of care and more frequently act as intermediaries in obtaining information about formal services (Johnson and Catalano, 1983). Hence, primary caregivers are usually spouses or adult children.

Spouses

In many instances, caregiving involves the "young-old" caring for the "old-old." Data from the National Long Term Care Survey reveal that 25.4 percent of caregivers are between 65 and 74, 10.1 percent are over 75, and the mean is 57.3 years of age. Of the 1.2 million elderly recipients of informal care represented by these data, 36.2 percent are between 75 and 84, 20.1 percent are 85 and older and the mean age is 77.7 (Stone et al., 1986). Elderly caregivers are likely to have functional limitations of their own that hamper their ability to provide adequate care to the spouse or parent for whom they care.

Although Soldo and Myllyluoma (1983) found that the majority of the caregivers in their sample were not functionally impaired, among elderly couples living alone, five percent of caregivers had moderate to severe functional impairments. Golodetz et al. (1969) suggest that, because of the special sympathy and commitment female spouses have for their impaired mate, they are often as needy as the patient and must be given special attention.

In addition to functional impairments, Cantor (1983) found spouse caregivers to be at great risk because they had the lowest incomes and were old themselves.

Gender differentials in potential caregivers result from increased life expectancy for women and the high probability that they will be widowed. In 1900, men had a life expectancy of 11 years at age 65 and women about 12 years. Today, women have a life expectancy of 18 years at age 65 and men 14 years. Some argue that life extension does not affect long-term care because morbidity among the elderly is compressed into a period close to death. Under this assumption additional years of life are healthy ones, thus prolonged life is not commensurate with increased burden on caregivers (Fries, 1980, 1984). However, even if the morbidity compression argument is valid, it does not eliminate the possibility that the effect of a particular health problem will be more severe than would have been the case. It is more likely that increased life expectancy will lead to more disabled elderly in the coming years (Schneider and Brody, 1983; Manton, 1982).

The fact that women outnumber men as age ascends is associated with a number of additional factors. The proportion of married persons declines from 63.7 percent of those 65 to 74 to 24.1 percent of those 85 and over, a large majority of the survivors are women. In addition, the proportion living with a nonspouse increases from 12.7

percent of those 65 to 74 to 38.6 percent of those 85 and older (Health Care Financing Administration, 1981).

Functionally impaired men are more likely than impaired women to be married because they marry older and die younger (Fengler and Goodrich, 1979). On the other hand, older women are more likely to live alone. In 1980, 41 percent of elderly women in the noninstitutionalized population lived alone compared to approximately 15 percent of older men (Health Care Financing Administration, 1981). Thus, while 75 percent more married than unmarried elderly with functional limitations rely exclusively on assistance from within the household, men are usually the recipients (Hess and Soldo, 1985). Moreover, when men do care for an impaired spouse, they are more likely to receive outside sources of assistance (Johnson and Catalano, 1983).

Some argue that responsibility for providing care to the noninstitutionalized elderly has become the task of women. Renewed interest in informal and family caregiving means that women are likely to shoulder the burden of increased expectations with less formal support. As a result, many researchers believe that "family care" and "informal support" are simply euphemisms for female family members (Osterbusch et al., 1986; Brody, 1981).

Preliminary data from the National Long Term Care Survey shows that nearly 33 percent of caregivers are primary caregivers who receive no outside assistance (Select Committee on Aging, 1987a). The overwhelming

majority are spouses. Similarly, an analysis of the National Long-Term Care Demonstration data reveals that 40 percent of caregivers were over 65 and nearly 15 percent were over 75 (Stephens and Christianson, 1986). Due to factors such as emotional strain, financial crises, and limited access to assistance, wives appear to provide care at greater risk to their own health and well-being than other primary caregivers (Cantor, 1983; Noelker and Wallace, 1985). Thus, Fengler and Goodrich (1979) conclude that wives of functionally impaired men are in particular need of support if their spouses are to remain in the community.

Older women who care for disabled spouses have been referred to as the "hidden patients" because they experience the emotional and physical demands of caregiving while dealing with their own aging process (Crossman et al., 1981). Isolation, loneliness, economic hardship, and role overload are just a few of the negative consequences of caregiving for elderly women caring for a spouse (Fengler and Goodrich, 1979). Despite the difficulty of providing care to the functionally impaired, these women seek institutionalization for their spouse only after exhausting their own physical and emotional resources (Crossman et al., 1981).

A recent study gathered data on 100 functionally impaired elderly persons who had made known their preference regarding where death should occur (Groth-

Juncker and McCusker, 1983). Each respondent utilized the services of a home health team. Of 68 patients who specifically asked to die at home, 49 were able to do so. The explanation given for the nonhome deaths of the remaining 19 patients was "a prolonged terminal phase leading to emotional and physical exhaustion in the patient and family" (Groth-Juncker and McCusker, 1983, p.457). Although none of the 19 patients suffered from a medical condition that could not have been met in the home, the multiple demands placed on the caregiving network were too great to avoid institutionalization or hospitalization prior to death.

Adult Children

The number of middle-aged couples with at least two living parents increased from 10 to 47 percent between 1900 and 1976 (Uhlenberg, 1980). By 1980, 40 percent of people in their late fifties, 10 percent of those in their late sixties, and three percent of those in their seventies had a surviving parent. Moreover, as the elderly population has grown, the birth rate has fallen drastically, increasing the likelihood that a middle-aged or elderly child will be faced with the prospect of caring for a functionally impaired parent.

Children, usually daughters, most often provide assistance to the elderly who lack support from a spouse (Stoller, 1983, 1985). Noelker and Townsend (1987)

utilized a sample of adult children with a parent over 60 who was either married and living with their spouse or female, widowed, and living alone. Each elderly person required assistance with at least one personal care activity on a daily basis. They found that gender and employment status were the only significant socio-demographic variables. Virtually all employed and unemployed daughters were caregivers while only 35 percent of employed sons and 54 percent of unemployed sons provided similar services. Thus, daughters of the functionally impaired assume the caregiver role despite other constraints on their time and capabilities.

Providing assistance to the noninstitutionalized elderly often impinges on a woman's ability to remain in the paid labor force. Brody (1985) found that 28 percent of the women in her study had quit work to stay home and care for their mothers while another 28 percent said they had reduced their hours or were considering quitting. A recent review of the caregiving literature concluded that the impact of caregiving on labor force participation is substantial (Horowitz, 1985). While women seem to be drawn from the work force to provide caregiving services, men are not. Men rely more on outside services and while employment significantly decreases total hours of assistance by sons, the same is not true for daughters (Travelers, 1985; Stoller, 1983).

Noelker and Wallace (1985) found that adult-child caregivers with children were the most likely to be employed, especially when divorced or separated. They speculate that despite the responsibilities of running a three generation household, the costs of child-rearing necessitate employment. Similarly, married adult children in two and three generation households experience substantially less financial burden than unmarried adult children in two generation households (Noelker and Wallace, 1985).

Brody (1981) has referred to these caregivers as "women in the middle" who are forced to deal with the increased likelihood that there will be an elderly parent to care for in middle age at the same time as they have children of their own and are increasingly involved in the labor force. Thus, roles as paid worker and as caregiving daughter have been added to their traditional roles as wife, homemaker, and mother. Moreover, the increased likelihood that these middle-aged female caregivers will experience a marital disruption suggests that the impact of employment and other responsibilities will significantly lower their ability to provide substantial caregiving services in the future (Cicerelli, 1983).

Structural changes occurring in society are likely to have a profound effect on the ability of these middle-aged female caregivers to continue executing this role. These changes include decreasing family size, the increased

likelihood of marital disruption, and the vast increase in the number of elderly persons likely to reach a very old age and encounter numerous functional impairments (Furstenberg, 1981; Cicerelli, 1983; Treas, 1977). Furthermore, the increase in recent years in female labor force participation has caused some to question the ability and desire of women to provide caregiving services in the future.

A survey of corporate employees found that of those providing care to an elderly relative, women were the most likely caregivers, some spending over 30 hours per week (Travelers, 1985). Working daughters have been found to provide amounts of transportation/shopping, money management, and emotional support equal to nonworking daughters, but they did provide less personal care (Brody and Schoonover, 1986). However, this loss in personal care was generally compensated for by increased help from formal and informal sources.

It has been reported that women feel a greater responsibility toward helping elderly parents than men (Townsend, 1965). Jarrett (1985) suggests that a positive concern for older relatives, not affection, is the driving force for most caregivers. Thus, those who hold stronger norms of family support tend to be younger family members who have yet to face the reality of providing care to a disabled elderly relative. When they do, the norm of affection increases their strain when they discover the

difficulty of caring for an impaired relative. Townsend and Noelker's (1987) finding that caregiving and noncaregiving children did not differ in their relationship with a care receiving parent is consistent with research which suggests that demographic factors and obligation may be more important than affection in motivating caregivers to provide helping services (Ikels, 1983; Cicerelli, 1983; Jarrett, 1985).

Johnson and Catalano (1983) found that strain is increased the longer the caregiving relationship exists and that caregiving children attempt to distance themselves physically and psychologically from the care-receiver in an effort to deal with this strain. In addition, Cantor (1983) found an inverse relationship between closeness and getting along well and a positive relationship between commitment to family and caregiver strain. Brody (1981) suggests that adult daughters may increase their own contribution to caregiving by decreasing sleep and leisure time when other sources of assistance are not available. Moreover, noncaregiving children tend to feel that the family is more effective at caregiving than those actually involved in caring for parents. This may result in part from magnification of the affective norms felt by those who are more involved in caregiving activities (Cicerelli, 1983).

The lack of a positive relationship between interaction with adult children and well-being among the elderly has

been noted (Lee, 1979). In relationships with adult caregivers, this finding has been attributed to a shift in the dependent nature of the relationship (Johnson, 1983). Stoller (1985) suggests that low morale among the impaired elderly is more strongly related to the inability to reciprocate rather than the actual receipt of assistance.

Unmarried adult children are less burdened by time and activity restrictions while their married counterparts report more negative health changes as a result of providing assistance to an impaired elderly person (Noelker and Wallace, 1985). Cicerelli (1983) found that adult children with disrupted marriages perceived their parents needs as significantly less than did adult children with intact marriages and showed less filial obligation. Adult children providing caregiving services who have experienced a marital disruption, particularly women, may not be able to cease employment as the elder for whom they care becomes increasingly frail, as married women might. Daughters and daughters-in-law are predominantly the helpers to elderly spouses who care for an impaired mate, and those without spouses. Moreover, they are more likely to share their home when independent living is no longer possible (Brody, 1985).

The economic grip that elderly parents had over their offspring in the past is no longer evident. Children are usually economically independent and able to fend off economic inducements from their parents to insure long-term

care (Treas, 1977). Moreover, cash assistance often moves in the other direction. Cantor (1983) found that 75 percent of her sample provided some form of financial assistance and that nearly 45 percent of respondents provided regular cash contributions. However, cash contributions from children are not common. In the late 1970's, only two to three percent of children provided cash assistance in a given year, down from five to 10 percent in 1961 (Schorr, 1980). Similarly, compared to their peers, caregivers are more likely to report family incomes below the poverty line (Select Committee on Aging, 1987a).

In sum, the literature suggests that there are several factors related to primary caregiving. Many of them are likely to vary by age of the care-receiver. First, there are several variables that fall under the rubric of the caregiver care-receiver relationship. These include the gender of both the caregiver and care-receiver, whether or not the caregiver is a spouse, whether or not the impaired elder lives alone, the age of the caregiver, and the impact of caregiving on the caregiver's employment status. Second, the length of the caregiving commitment, the total number of hours spent caregiving, and affection for the care-receiver are related to morale and commitment. Finally, the functional status of the primary caregiver is an important factor. These variables are associated with primary caregiving and, together with the informal and formal support networks, constitute the caregiving network.

The Informal Support Network

Informal support consists of all unpaid help provided by family, friends, neighbors, or others not part of a group formally organized to provide long-term care assistance (Branch and Jette, 1983). The informal support system provides more support to the impaired elderly than formal services and without them many elderly persons would be forced out of their homes and into institutions (Cantor, 1983). Family and friends provide over 50 percent of services received by the elderly at all levels of functioning and over 79 percent for those who are severely impaired. In many respects, informal support networks are a significant source of cheap labor. Furthermore, the presence of an additional adult available to care for an impaired elder may benefit a primary caregiver by sharing responsibility and providing time to address competing demands (Soldo and Myllyluoma, 1983).

Family

While the presence of kin is one indicator of the potential resources of the long-term care network, Soldo (1985) suggests that it overestimates the true supply by failing to account for other key factors such as sex of the potential caregiver. In her sample, 20 percent of the elderly had no daughters, and of those with daughters, 40 percent were not functional in terms of their frequency of contact and another third did not have a daughter living

nearby. Thus, when Shanas (1979) reports that 80 percent of the elderly have at least one adult child and 75 percent have children within a half-hour drive, the implications for caregiving should be carefully considered. Nevertheless, family members are relied on most frequently by elderly persons with functional limitations and friends help out most when the elderly are unmarried and far from their children (Stoller and Earl, 1983).

Though most elderly people wish to remain independent, they generally turn to children when in need of assistance (Brody, 1977; Neugarten, 1975; Shanas, 1979; Troll, 1971). Parents usually live in close proximity to at least one child and maintain contact with and receive assistance from their adult children (Shanas, 1979). Daughters-in-law provide a great deal of support while sons-in-law give very little (Gilhooly, 1984). Other researchers have reported that between 75 and 80 percent of care received by older persons is provided by older children, but that these resources are inadequate and due cause for public concern (Krout, 1983). Many studies have noted that intergenerational assistance within families is reciprocal (Shanas, 1968; Streib, 1965; Troll, 1971), but maintaining an appropriate balance becomes increasingly difficult as a functionally impaired elderly individual needs more help.

There is a great deal of evidence to suggest that a mutual helping relationship between parent and child continues throughout life (Bengtson, 1979). While parents

help their offspring from childhood through middle age, illness and/or the loss of economic and social support shifts the balance of helping to the parents (Cicerelli, 1983). Nevertheless, the ability of an impaired elder to provide reciprocal services may increase the likelihood that caregiving services will be forthcoming.

Brody (1981) found that granddaughters, more than their mothers or grandmothers, felt strongly about filial norms regarding what the older generation should expect from the young. In their study of racial differences in support of filial norms, Hanson et al. (1983) found that whites were more likely than blacks to support such norms. However, it is important to note that they gathered data on individual's perceptions of norms, rather than actual behavior. Hanson et al. (1983) found that while whites demonstrated more support for norms of familial support than blacks, blacks were more likely to include the elderly in their family structure and treat them with more respect. Nevertheless, younger respondents in both racial groups exhibited stronger support for norms of familial support. The no association or negative association finding between family contact and morale is often explained by the contrasting interests between generations and the reversal of roles that often takes place as the elderly become increasingly impaired.

Friends and Neighbors

While family members generally provide for the nonpersonal daily needs of the noninstitutionalized elderly and provide support in times of illness (Shanas, 1979; Sussman, 1977; Hendricks and Hendricks, 1977), another source of assistance is from friends and neighbors. Nevertheless, despite the ability of these resources to assist intermittently and in a supplementary fashion, they are unable to deal with the functionally impaired elderly on a long-term basis (Litman, 1971; Shanas, 1979). Moreover, the willingness of friends and neighbors to provide such assistance cannot be equated with the competence to meet needs effectively over long periods of time (Stoller and Earl, 1983).

Arling (1976) found that friendship and neighboring were negatively related to loneliness and worry. Furthermore, these relationships were satisfying because they were based on common interests and lifestyles and were characterized by voluntary involvement and reciprocity. Friends and neighbors provide companionship and share activities, although health, income, and education are related to these interactions (Arling, 1976).

Reliance on friends is highest among elderly persons who are single and have few family members within an hour's drive (Stoller and Earl, 1983). In a study of inner-city elderly, Cantor (1979) reported that when family members are not available, friends and neighbors are important in

providing informal services, particularly companionship, care when ill, and shopping. However, there is also a high degree of reciprocity in these relationships. The most important function of friends and neighbors appears to be as reserve forces when support from family is unavailable or nonexistent.

In a study of men who had experienced a first myocardial infarction, neighbors and friends were primarily supplements to family aid (Croog et al., 1972). Moral support and "services" were most often furnished by friends and neighbors while financial aid came from family members. Rosow (1967) reached a similar conclusion in a study of aid furnished to the elderly. An important corollary to this conclusion is that the length of commitment is a crucial factor related to the degree of contribution (Litwak and Szelenyi, 1969).

One survey shows that 10 percent of the impaired elderly with a informal support network use formal services compared to 80 percent without a similar resource (Soldo, 1985). Formal services are likely to be used when the elderly's functioning declines, particularly when mental impairment, incontinence and paralysis are factors (Dunlop, 1980; Soldo, 1985). Bass and Noelker (1987) found that stress was a factor in initiating the use of home-care services, but the amount of formal services is not related to caregiver stress once formal services have begun.

Rural-Urban Differences

Health concerns of the rural elderly have not received the same attention given to their urban counterparts (Preston and Mansfield, 1984). This is particularly interesting in light of the fact that over one-third of the elderly live in nonmetropolitan areas (Harbert and Wilkinson, 1979) and the population of older people in rural America has been growing at a disproportionate rate relative to the general population (Longino et al., 1984). Although at least one study found no significant differences in reports of assistance with personal care activities between metropolitan and nonmetropolitan elderly populations (Stoller and Earl, 1983), the majority of available research suggests that there are rural-urban differences in health related factors such as the availability of services and number of practitioners (Coward and Rathbone-McCuane, 1985; Krout, 1986).

Rural elderly people report more chronic illness and physical impairment than their urban counterparts. This may be due in part to the difficulty in developing an effective support network in rural areas. Limited financial resources and the broad dispersion of rural residents restricts access to services available to elderly urban residents (Nelson, 1983; Coward and Lee, 1985). Moreover, service providers often fail to consider cultural differences between rural and urban elderly that affect factors such as transportation, program acceptance and the

structure of informal helping networks (Blieszner et al., 1987).

In support of Litwak's (1985) assertion that informal groups are best suited to performing activities that require proximity and commitment, Blieszner et al. (1987) found substantial differences in the types of assistance provided to the impaired elderly. Rural residents were most likely to receive homemaking, meal preparation, and supervision help from family members. In contrast, the urban elderly relied on formal organizations for homemaking, personal care, meal, and supervision services. Moreover, a higher percentage of urban elderly received assistance with meal preparation from sources such as friends and neighbors. Proximity to services, the concentration of care-receivers in defined areas, and access to informal sources of support are the reasons for these differences. Blieszner et al. (1987) suggest that education about available services, the availability of additional services, and special training for informal caregivers may provide the rural elderly with a level of health care more comparable to their urban peers.

From an epidemiological perspective Berkman (1983) reviews the relationship between social networks and disease causation. After identifying widows, the poor, and the geographically dispersed as particularly at risk, she asserts that many conditions theoretically capable of causing disease are held in common by these groups. The

specific focus of the research is the effect of support network relationships, individually and cumulatively, on mortality. Results showed that people lacking sufficient social and community support were 2.5 times as likely to die by a nine year follow-up. Moreover, specific network characteristics identified as important are: size; frequency of contact; density ("the extent to which members of a person's social network know and interact with one another" (p.746)); intimacy; length of relationship; geographic dispersion; and reciprocity (Berkman, 1983).

There is evidence that the significantly lower availability of support services places the rural elderly at greater risk of being institutionalized (Nelson, 1980; Greene, 1984). The availability of day care, homemaker, and foster care services, as well as the number of acute care hospital beds are substantially less in rural settings (Nelson, 1980). Moreover, rural nursing home residents have more chronic diseases than the national average (Dahlstein and Shank, 1979). A partial explanation for these disparities is that one-quarter of Medicare dollars go to rural areas, where two-thirds of Medicare recipients live (Kim, 1981). As a result, rural elderly persons are likely to enter a nursing home earlier than a comparably disabled urban counterpart who can avail themselves of a broad range of home-based support services (Nelson, 1980).

In sum, network size, frequency of contact, the ability to provide respite for the primary caregiver, reciprocity,

and geographic location are significant factors in a functionally impaired elderly persons informal support network. Functionally impaired elderly people who have larger informal networks, more frequent contact with family and friends, and a network capable of providing respite care will usually reside in the community at increased levels of disability and with a minimal amount of caregiver stress and burden. In addition, functionally impaired elderly in urban environments and those who are capable of reciprocating will generally have more access to care and less negative feelings about accepting such assistance. The extent to which these factors contribute to an overall measure of caregiving is expected to differ by age of the care-receiver.

The Formal Support Network

Formal support refers to organized care provided by government or voluntary organizations or agencies that exist to provide long-term care services to the noninstitutionalized impaired elderly (Branch and Jette, 1983). Wife caregivers use social services more than husband caregivers, and the greatest use is among divorced or separated adult children with children of their own (Noelker and Wallace, 1985). In a Michigan sample, those assumed to need the greatest assistance, older, single and widowed, black, and poor clients received the greatest amount of noninstitutional well-being care (Barney, 1977).

Some researchers argue that home-care services make the caregiver more willing physically and mentally to assist an impaired relative. Adult day care and respite services are favored because they provide the caregiver with spare time (Lave, 1985). Yet, while these services can ease the burden of day-to-day caregiving by providing time to perform other tasks, they do little to ease the burden generated by the long-term responsibility of caregiving (Quadagno et al., 1987).

Some combination of formal and informal long-term care is the preference of most functionally impaired elderly people (McCauley and Blieszner, 1985). However, among the low-income elderly, it is usually easier to receive funding for nursing home care than sufficient home-care services. Because Medicaid policies treat home-care as a low-cost substitute for institutionalization, such services are available only to elderly persons who are ill or disabled to the point of needing nursing home care (Osterbusch et al., 1986). The outcome of this policy approach is that the unpaid efforts of caregivers are discounted and elderly persons without friends or family to provide care receive additional benefits from the formal sector.

While Brody (1981) concluded that the extent to which families were presumed to shift parental caregiving responsibilities to the public sector was a myth, Stoller (1985) found a negative relationship between formal service utilization and informal assistance--the substitution

effect. Hooyman et al. (1985) found, contrary to their expectations, that the presence or absence of chore services was not related to the type, frequency, or duration of assistance to older relatives. Their explanation is that families may be providing all the care they are willing or able to give. Moreover, the loss of these services was not related to changes in perceived burden by the caregiver. They did, however, find a relationship between the perception of burden and personal care tasks, suggesting that formal services need to coordinate more closely with families regarding those activities they find most burdensome (Hooyman et al., 1985).

Seemingly contradictory evidence regarding the extent to which formal care is a substitute for informal care may not be inconsistent. It may be that when families are available they care for the elderly and "pilot" the utilization of formal services, thus using formal and informal support in a complementary fashion. On the other hand, in situations in which the childless aged are more likely to be institutionalized, formal services may substitute for informal assistance that does not exist (Streib, 1983; Fengler and Goodrich, 1979). Chappell (1985) found, as have others (Shanas, 1979), that users of formal services are more likely to be female, older, former housewives, widows, and live alone. Furthermore, they are less active and in poorer health. Formal services alone

are not sufficient to provide adequate care, and need, rather than the availability of formal services, is the primary predictor of their use.

The inability of formal service providers to complement family care may eventually interfere with the affective quality of the caregiver care-receiver relationship. Litwak and Figueira (1968) suggest that an optimal sharing of functions is achieved when families respond to socioemotional needs, an activity to which they are best suited, and bureaucracies deal with predictable or routine tasks. This may explain why Krout (1983) reports that many elderly have negative attitudes toward services, are unaware of available services, and have very low utilization rates. However, among nonmetropolitan elderly persons those who are better educated, female, and married are more aware of social service programs.

Bass and Noelker (1987) found that the primary caregiver has the greatest influence on the use of in-home services, particularly if they experience stress effects as a result of caregiving. Moreover, increased services are used by impaired elderly persons whose families assist with more personal care tasks. This may result from their increased knowledge of the caregiver's needs or a desire to alleviate their own burdens and responsibilities.

In sum, factors such as the number of people involved in providing formal support, whether or not paid helpers assist in personal care tasks, the length of commitment by

the formal sector, and the frequency of contact are important aspects of formal support. The greater the number of helpers, the more they assist with functional disabilities, the longer their commitment and the more frequent their contact, the less will be the burden on the primary caregiver and informal network. However, these factors are clearly related to economic factors discussed previously. Furthermore, it is expected that the role of the formal sector will vary by age of the care-receiver in explaining antecedents to institutionalization.

Impairment

The tasks associated with caregiving range from assistance with activities of daily living (Stoller and Earl, 1983), to support and companionship (Clark and Rakowski, 1983), and piloting the elderly person through the bureaucratic maze of formal assistance (Streib, 1983). When the impaired elder is of questionable competence, the piloting role of the principal caregiver is often more stressful (Gilhooly, 1984). Other sources of stress for the primary caregiver include the competing demands of other household members, the frustration of locating community programs, isolation, and anxiety over the availability of back-up services (Soldo and Myllyluoma, 1983). In a study of physician visits by the elderly (Arling, 1985), it was found that the second best predictor after medical condition was increased stress. Moreover,

Shapiro and Roos (1985) found that nonusers of physicians among the elderly were more likely to be single, have some mental impairment, and low educational attainment. Thus, piloting appears to be a significant factor in obtaining physician services and thereby continuing to maintain an impaired elderly person in the community.

Nearly a quarter of a century ago Williamson et al. (1964) were surprised at the frequency of multiple disabilities in their sample of home-bound elderly. Today multiple disabilities are recognized as a significant determinant of institutionalization. Yet, while age differences explain some variation in functioning, in a disabled population it is not necessarily a functioning ability predictor (Brody et al., 1978).

Nursing home residents are predominantly female, generally over 75 years old, and unmarried (Pablo and Cleary, 1982). Moreover, marriage rates have dropped, divorce rates are high, and it appears that remarriage is becoming less common (Norton and Moorman, 1987). As a result, it seems likely that even higher proportions of future cohorts will be unmarried elderly women (Watkins et al., 1987).

As a patient's functional impairments increase, the need for nursing home care will increase as the ability to provide for their own care declines (Kane and Kane, 1981). Greenberg and Ginn (1979) used a multivariate approach to determine factors related to nursing home placement. They

found that sex, marital status, informal support, family attitudes, Activity of Daily Living scores, the ability to take medications and make decisions, and income were all important factors.

Activities of Daily Living

Global health measures are limited in their ability to indicate levels of independence that are possible despite diseases and impairments. The same illness or disease can have different consequences for how a particular person carries out routine daily tasks. As a result, Activity of Daily Living (ADL) measures have been utilized for over two decades to assess basic self-care activities that impinge on independence (Kane and Kane, 1981). According to Sangl (1985, p.93) these measures, "provide a more practical and parsimonious means of estimating general long-term care requirements than coping with the complex of morbid conditions and disabilities that actually characterize an individual's health state." The best known index sums a dichotomous rating on six self-care functions: bathing, dressing, going to the toilet, inside movement, continence, and feeding (Katz et al., 1963). The Katz Index is the most carefully tested and has proven valid in determining the need of an elderly person for assistance and ultimately institutionalization.

Instrumental Activities of Daily Living

The concept behind the measurement of Instrumental Activities of Daily Living (IADL) is that some activities are more complex than those for personal self-care and may be more easily neglected as physical, emotional, and psychological health declines. It has been suggested that IADL indices reflect the social situation rather than innate ability and that they overemphasize tasks customarily performed by women (Kane and Kane, 1981). Like ADL measures, IADL tools generally use a dichotomous rating on several activities. One of the most frequently utilized IADL instruments includes using the telephone, shopping, walking distances, preparing meals, doing housework, taking medicine, and handling money (Duke University, 1978). Because of their diversity, IADL results are difficult to interpret as varying levels of complexity are possible with each item (Kane and Kane, 1981). IADL measures assess mental as well as physical functioning.

In reporting on a national survey of the noninstitutionalized population over age 65, Shanas (1979) found that three percent were bedfast and seven percent housebound. Branch and Jette (1983) found that in their sample 80 percent of the elderly were self-sufficient relative to ADL functioning, but 82 percent required some long-term assistance in performing IADL functions. Assistance with both ADL and IADL functions increased with age. Of those 85 and older, 42 percent needed help with at least one ADL

function and 99 percent required help with at least one IADL function.

Stress and Burden

Older caregivers have difficulty sustaining long-term care obligations while younger caregivers report greater subjective feelings of burden and stress (Brody, 1985; Cicerelli, 1983). Older caregivers, usually women, are more likely to care for spouses who are functionally impaired. They are less likely to be affected by feelings of stress and burden and hold out until their own ability to provide caregiving services or the care-receiver's impairments become so great that institutionalization is the only option. On the other hand, younger caregivers faced with a variety of responsibilities may reach a threshold level of stress before the functional impairments necessitate nursing home placement.

Respite services ease the stress of day-to-day caregiving, but do little to ease the burden generated by the long-term responsibility of caregiving. Research consistently shows that the extent of functional impairment is related to caregiver burden and the use of support services (Perlman and Giele, 1982; Noelker and Townsend, 1987). Quadagno et al. (1987) contend that the provision of formal services can relieve the stress of daily caregiving, but does little to relieve the subjective

feelings of burden felt by caregivers constrained by the caregiving role.

Stress

Support networks have been identified as a protective measure against stress (Cobb, 1976). This is especially important when considering that the greatest stress is often expressed by those in the poorest health (Preston and Mansfield, 1984). Noelker and Wallace (1985) suggest that differences in stress effects among caregivers in their sample may be related to differences in their support systems. Mental health symptoms such as depression, anxiety, helplessness, isolation, and many others have been linked to the difficulties inherent in providing prolonged caregiving services (Cantor, 1983; Frankfather et al., 1981).

Research on supporters of the elderly have found that caring for the mentally impaired is more stressful than caring for the physically impaired (Gilhooly, 1984). Yet it appears that specific problems, rather than general impairment causes the greatest strain. The duration of dementia and frequency of visits from other family members have been linked to stress among primary caregivers. The former increases stress while the latter decreases it. Although some have found that stress and burden is less among nonresident supporters, this may be due to the

increased likelihood that elderly people living alone receive assistance from formal services (Gilhooly, 1984).

Gilhooly (1984) found that better mental health scores were obtained from caregivers of females and that male caregivers have higher morale. This latter finding, however, may be linked to the greater likelihood that men receive additional assistance when they provide caregiving services. Moreover, the greater the distance to the elderly person, the greater the mental health. Finally, receipt of home-based services was correlated with both mental health and morale.

Bass and Noelker (1987) found that in-home nursing or aide services were used more frequently when the primary caregiver experienced greater caregiving related stress effects. Primary caregivers are also able to cope with stress more easily when they are successful in developing a support network of kin, friends, and neighbors (Preston and Mansfield, 1984). Stress is especially problematic in situations in which a caregiver lives alone with an impaired elder and no one is available to buffer interactions between the caregiver and care-receiver (Gilhooly, 1984). Stress is most frequently measured by a single item subjective response.

Burden

Burden is broadly and variously identified with the emotional costs of embarrassment and overload, disruption

of the daily routine, and financial and health deterioration (Poulshock and Deimling, 1984). It is a multidimensional concept closely tied to individual interpretations of caregiving contexts. Poulshock and Deimling (1984, p.238) conclude that "the concept of burden should be used to refer to the subjective perceptions of caregivers related to the degree of problems experienced in relation to elders' specific impairments." Thus, burden is frequently measured by multiple item indices that address the extent to which caregiving behaviors have changed as a result of caregiving (Hooyman et al., 1985).

Senile dementia affects five to 10 percent of the elderly population and results in cognitive impairments and memory loss which necessitate supportive care (Zarit, Reever and Bach-Peterson, 1980). Although nursing home placement is an option, most afflicted individuals live in the community. In their study of caregivers of elderly persons, Zarit et al. (1980) found that the severity of the dementia was not associated with greater feelings of burden and the burden on the caregiver was less when more visits were paid by other relatives.

Deprivation occurs in the areas of personal desires, individuality, and socialization as caregivers seek to protect their families and their work, often at great expense to themselves (Cantor, 1983). Furthermore, Cantor (1983) found that demographic (age, sex, race, SES, marital status, relationship to caregiver), situational (elderly

health status, work status, financial stability, geographic proximity, amount of assistance provided), and attitudinal (worry, compatibility, value of family) variables accounted for 56 percent of the variance in caregiver strain. The closer the bond the greater the strain.

Robinson and Thurnher (1979) found that mental deterioration of the care-receiver and feelings of confinement by the caregiver were the primary determinants of stress among the latter. Johnson and Catalano (1983) found that caregivers of elderly persons who remained dependent eight months after hospital discharge were likely to maintain physical and psychological distance as a means of coping with stress and burden. One means of increasing psychological distance is through the enlargement of the family network which provides day-to-day care. Another adaptive technique is role entrenchment, treating caregiving as a full time job. However, fewer and fewer caregivers will have this option in the future.

In sum, there are two primary antecedents to institutionalization frequently addressed in the literature, increased functional impairment among the elderly and caregiver stress/burden. Nevertheless, little is known about how these general factors are associated. For example, does increased impairment lead to stress then to institutionalization, or is stress/burden a separate construct altogether? The method of analysis employed in this research will allow the fit of a simultaneous system

in order to explore the inter-relationship between functional impairment and caregiver stress/burden.

Summary

In this review of the literature, household and caregiving economics, primary caregiving, informal support, formal support, functional impairment, and stress/burden have been identified as key components of caregiving. Although previous research suggests that these components are interrelated, it is not known to what extent they are associated nor how they vary. In order to address this issue, the following chapter develops a conceptual framework that posits relationships among these concepts.

CHAPTER THREE
SHARED FUNCTIONS: A CONCEPTUAL FRAMEWORK

The social context within which a particular topic of research gains currency is crucial to conceptualizing a problem, analyzing data, interpreting findings, and assessing future implications. The purpose of a conceptual framework is to identify explicitly concepts, assumptions and other information relevant to the research and lay the groundwork for interpreting existing literature and building systematic, cohesive theory (Merton, 1968). Inasmuch as a framework is designed to provide a general orientation to the topic it is a "conceptual map" that orients the reader to the terms and relationships that structure the research agenda (Wood, 1988).

The conceptual framework developed in this chapter is based on Litwak's (1985) general sociological principle that groups can optimally manage those tasks that match them in structure. Hence, primary caregivers, informal support networks, and formal support networks contribute to the care of a functionally impaired elderly person by performing those tasks best suited to their structure. Inasmuch as the structure of these endogenous constructs changes by age of the care-receiver, the tasks associated with each will be altered. Consequently, the tolerance of

increased functional impairment among the elderly and the mediation of caregiver stress will be differentially explained.

Primary Groups, Informal, and Formal Networks

Sociologists have long been concerned with the role of primary groups in modern industrialized societies. Family members, neighbors, friends, and other sources of informal support have been recognized for their exchanges based on affection, respect, and responsibility, rather than the monetary expectations of formal organizations (Cooley, 1909). Because of their competing structures, many theorists have assumed that a choice between formal and informal organizations is necessary in modern societies. For example, Weber (1947) emphasized a monocratic bureaucratic structure and Parsons (1944) and Parson and Bales (1955) advocated the coexistence of bureaucracies and family systems in isolation. Litwak (1985), on the other hand, suggests that the needs of both family systems and bureaucracies can best be served through balanced cooperation.

Cooley (1955) identifies face to face contact, permanency, affection, noninstrumental tasks and diffusion as key characteristics of primary groups such as kin, friends, and neighbors. Accordingly, the structure of primary groups is ideal for carrying out tasks which do not require precision, training, or experts. On the other

hand, Weber argues that in a mass industrial society bureaucratic organizations, which emphasize precision, training, and expertise, are necessary for accomplishing most goals (Gerth and Mills, 1946). The implicit assumption made by Weber is that where one type of organization is most effective, the other will be eliminated (Litwak and Figueira, 1968). Carried to its logical extreme, Weber's theoretical formulations leave little room for the survival of primary groups in an optimally industrialized society. Thus, for Weber, bureaucratic organizations supercede primary groups as mass industrialization increases.

Weber asserts that bureaucratic organizations thrive in industrialized societies because they are designed to maximize knowledge and insure that an individual with the right knowledge is available to do a particular job at the right time (Litwak and Figueira, 1970). A hierarchical authority system, specialization, and impersonal relations are emphasized in order to avoid favoritism, focus on organizational goals, and develop expertise. By developing these characteristics, bureaucratic organizations are theoretically capable of managing many of the tasks currently carried out by primary groups.

The monocratic bureaucratic organization is an essential characteristic of modern industrial society according to Weber (1947). He argued that technological knowledge is the cornerstone of a modern industrialized

society and that the maximization of such knowledge requires bureaucratic organizations. In order to facilitate these developments, it is necessary to reinforce social ties that are the antithesis of the informal primary group (Litwak, 1985). The introduction of task simplification in the labor force, money as a generalized form of motivation, and an emphasis on expertise means that impersonal rather than affective ties must be stressed. In short, the norms, ideologies, and objectives of a modern industrial society make it difficult for bureaucracies and families to coexist without a great deal of conflict (Weber, 1947).

One of the latent effects of industrialization is the need for members of primary groups to adjust to differential geographical and occupational mobility (Litwak and Szelenyi, 1969). Parsons recognized the inherent conflict between bureaucracies and primary groups with regard to these considerations and suggested that the isolated nuclear family was a unique primary group capable of surviving the demands of modern society. He argued that conflict can be diminished and that both bureaucracies and family systems can prosper if they remain isolated from one another as much as possible (Sussman, 1977).

Unfortunately, Parsons' solution was to posit the universality of the isolated nuclear family with little consideration given to changes in other informal systems or formal organizations. The isolated nuclear family was

conceptualized as a two-adult marital household with one involved in the labor force (Parsons, 1944). This structure permits commitment to the industrialized workforce while at the same time reducing the expectations and tasks of the primary group. The role of extended family systems was expected to decline due to geographical and social dispersion.

Parsons also argued that the isolated nuclear family was capable of performing some necessary tasks better than bureaucratic organizations. This was precisely because such tasks required flexibility, commitment, affection, and other characteristics not commensurate with bureaucratic structures. Childhood socialization and tension management among adults are two tasks that any industrialized society must fulfill in order to survive. They are best suited to the noninstrumental relations between individuals found in primary groups (Parsons and Bales, 1955). Therefore, as long as the competing structures of primary groups and bureaucratic organizations remain isolated, the needs of industrialized society will be met.

Neither Weber's theory of bureaucratic organizations nor Parsons' alternative explanation have been supported by the empirical data. The theoretical assertions of Weber were based on optimal conditions typical of his use of ideal types. Thus, the continued prominence of primary groups can only suggest that this optimal state of effectiveness has not been realized (Litwak and Figueira,

1968). The assertion by Parsons that the isolated nuclear family is the only primary group structure that can survive in an industrialized society has been disproved by many who have found that primary groups, particularly extended family systems, maintain their cohesion in spite of the challenges of industrialization (Sussman and Burchinal, 1968; Litwak, 1960a, 1960b). Lacking evidence to support these theoretical orientations at opposite ends of the spectrum, another alternative explanation has received empirical support.

Litwak and Figueira (1970) proposed a "theory of shared functions" which posits that most responsibilities have two components. One can best be managed by the specialized training of the formal sector and another by the everyday experience of primary groups. Thus, while differences in organizational structure necessitate maintaining some distance, coordination of activities is necessary to accomplish most tasks (Litwak, 1985). This shared function approach is based on the "balance theory of coordination" (Litwak and Meyer, 1966; Litwak, 1978). Accordingly, conflict is minimized by finding a fulcrum between primary groups and the bureaucratic structure of formal organizations such that they are close enough to enable coordination of activities, but far enough apart to avoid conflict. The predictive ability of this approach is dependent on the tasks attributed to each group and their competence in carrying them out.

The empirical data appear to support the theory of shared functions (Cantor, 1979). Moreover, the implication of each perspective for the functionally impaired elderly is quite different. According to Weber, formal organizations should accept responsibility for the aged. Institutionalization would receive widespread support and efforts by informal sources to provide assistance to impaired elderly persons would not be reinforced. Parsons would encourage informal assistance for the functionally impaired elderly to the extent that it did not interfere with the functioning of the family group in the larger social system. While recognizing the need for primary groups and formal organizations to remain autonomous, Litwak argues (1970) that the needs of older people will best be served through balanced cooperation.

Group Structure and Matching Tasks

Litwak (1985) argues that three situations are not optimally dealt with by formal organizations. Unpredictable events, situations with numerous contingencies, and tasks not easily subdivided are not easily addressed through technological knowledge. These nonuniform events are best accomplished by primary groups. The "balance theory of coordination" (Litwak and Meyer, 1966; Litwak, 1978) posits a continuum of organizational structures and of tasks. Primary groups are at one end of the structural continuum dealing with nonuniform tasks

while formal organizations are at the other addressing uniform tasks. In between are variations which include other family members, friends, neighbors, and other potential sources of support. A parallel continuum identifies those tasks that are accomplished best by certain organizational structures. An "optimal sharing of functions" is achieved when family systems address socioemotional needs and bureaucracies concentrate on routinized tasks (Litwak and Figueira, 1968).

Litwak (1985) identifies five dimensions for classifying tasks that describe the structure of, and exchanges by, a particular group or groups. Proximity, length of commitment, size of group, life-style commonality, and internalized versus instrumental motivation provide a basis for assessing the ability of certain structures to accomplish various tasks. For example, kin are not proximate, are committed for the long term, are a larger size group, have varied lifestyles, and have internalized motivation for providing assistance. Thus, they are likely to provide short-term home nursing, manage financial matters, provide emotional support, and assure economic stability. On the other hand, neighbors, who are proximate, have varied lengths of commitment, form a smaller size group, generally share similar life styles, and have internal motivation, are likely to watch the house while an elderly person is gone and be a source of borrowing small items.

The concept of functional substitutability suggests that when the optimal source for the assumption of certain tasks is not available, they may be fulfilled if other groups with the same dimensions are available. Litwak (1985) argues, however, that because dimensions are rarely the same, deleterious consequences may result. For example, the assumption of responsibility for a functionally impaired elderly person by a nonspouse relative can strain the resources of the caregiver's family system as well as of the elderly care-receiver. It is in these situations that all components of the caregiving network must work together to facilitate adequate care.

A Model of Caregiving

Based on Litwak's (1985) theory of shared functions the caregiving network is conceptualized as an overarching higher order construct that is not measured directly but is identified indirectly from correlations among three components: the primary caregiver, the informal network, and the formal network. Moreover, these components and the caregiving network are affected by the impaired elderly person's economic situation and mediate its influence on functioning and caregiver stress/burden. Functional impairment and caregiver stress/burden are mutually influenced by each other, but the nature of these relationships is not known. As a result, they are simply

correlated in their error structures. These relationships are depicted in Figure 3-1.

The constructs in Figure 3-1 have several indicators, each of which has been identified in the literature review. Figure 3-2 depicts the relationships between the unobserved constructs shown in Figure 3-1 and their multiple indicators. Although the symbols will be explained in chapter four, the model represents the set of relationships that are believed to explain the relationship between caregiving and antecedents to institutionalization. For now, Figure 3-2 can be used as a pedagogical tool for explaining the model of the caregiving network. It is this model that will be tested on empirical data.

Income, Medicaid status, and race are generated by a latent variable, or factor, referred to as household and caregiving economics. The primary caregiver, informal network, and formal network components, as well as the second-order factor (caregiving network), are assumed to be affected by the household and caregiving economics component and mediate its influence on functional impairment and caregiver stress/burden.

The second major component, the primary caregiver, explains the covariation in three observed variables, length of caregiving, total hours of care, and affection and is influenced by two exogenous constructs, the caregiving relationship and caregiver functioning.

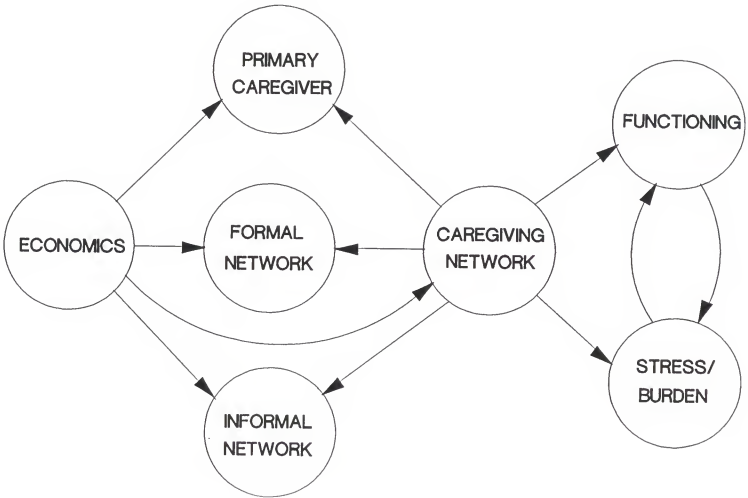

Figure 3-1: Proposed Model of the Caregiving Network

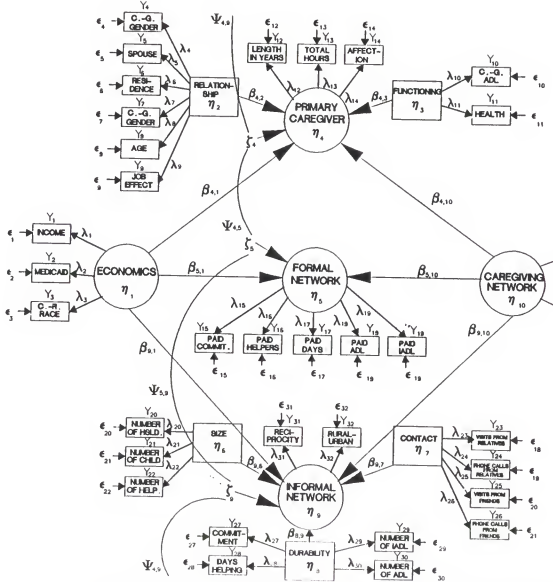

Figure 3-2: A Complex Model of the Caregiving Network

Caregiver gender, spousal status, living arrangement, care-receiver gender, caregiver age, and caregiver employment status are determined by an unobserved variable referred to as the caregiving relationship. Caregiver personal care impairments and subjective health are generated by a latent factor identified as caregiver functioning.

The third major construct is the informal network. It is a latent variable that generates two observed variables and is influenced by three exogenous factors. Reciprocity and urbanness are determined by the informal network component. The covariation between household size, number of children, and number of helpers is explained by an unobserved variable referred to as informal network size. The frequency of contact construct generates four observed variables, telephone conversations with relatives and friends, and visits with relatives and friends. The covariation between the number of ADL functions and IADL functions, as well as the length of commitment and number of helping days is explained by an unobserved factor referred to as durability.

The formal network explains the covariation in five observed variables: the length of commitment of paid helpers, number of paid helpers, number of helping days, number of ADL functions performed by paid helpers and the number of IADL functions performed by paid helpers.

The covariation in the three major caregiving components, primary caregiving, the informal network, and

the formal network, is explained by a second-order factor, the caregiving network.

The functional status of the elderly care-receiver and caregiver stress/burden are the two major antecedents to institutionalization. The model depicted in Figure 3-2 allows the error terms for care-receiver functioning and caregiver stress/burden to correlate. Moreover, the second-order factor, the caregiving network, is assumed to be a direct causal determinant of these components.

The following are specific hypotheses that will be addressed in the empirical analysis. Their lack of specificity reflects the state of theoretical development in research on caregiving, particularly as it relates to the age of the care-receiver. Nevertheless, the analyses generated by these propositions will provide more insight into relationships related to caregiving of the functionally impaired elderly.

Hypothesis #1: Statistically significant differences are expected when comparing the characteristics of age stratified samples of functionally impaired elderly persons and their caregiving network.

Chi-square and analysis of variance statistics will be utilized to compare differences between those 65 to 74, 75 to 84, and 85 and older on characteristics associated with the impaired elderly, primary caregivers, the informal network, and the formal network. The literature on the

elderly generally, and caregiving specifically, tends to treat those 65 and older as a homogenous group. As a result, relatively few dissimilarities by age of the care-receiver have been delineated. While it is known that spouses are less available as impaired elderly people age and widows are more likely to live alone in old age, little is known about living arrangements, amount of help received, and specific personal care needs. These differences must be delineated in order to fashion policy recommendations designed to address better the conditions under which functionally impaired elderly people can avoid institutionalization without further taxing the economic and interpersonal constraints of the caregiving network.

Hypothesis #2: The theoretical model depicted in Figure 3-2 is expected to fit the data, thus providing evidence that it is a plausible representation of the caregiving network.

There are several ways to assess a good model fit. First, the data analysis should yield an acceptable chi-square to degrees of freedom ratio. Wheaton et al. (1977) suggest that a chi-square to degrees of freedom ratio of five to one is acceptable, while Carmines and McIver (1981) opt for a more conservative rule in the range of two to one or three to one. Second, the analysis should generate a small root mean square residual, a measure of the average residuals. Finally, the adjusted goodness of fit, a "measure of the relative amount of variance and covariances

jointly accounted for by the model" (Joreskog and Sorbom, 1982, p.408), should be greater than .90.

Economics are expected to play a large role in the ability of a caregiving network to maintain a functionally impaired elderly person in the community and mediate caregiver stress/burden. Therefore, this underlying construct is hypothesized to influence the structure of the components of the caregiving network by making available paid help or the possibility of institutionalization. Covariation in three unmeasured constructs, primary caregiving, the informal network, and the formal network will be explained by an endogenous construct referred to as the caregiving network which then influences functional impairment and caregiver stress. Caregiver stress/burden will be alleviated for many of the reasons that functional impairment will be tolerated. Stress/burden is particularly problematic as family members and informal sources of support take on tasks for which their structure is not compatible. The difficulty of providing adequate caregiving services and maintaining their own family system may be alleviated by increased assistance from the formal sector. This involvement will be increasingly necessary as the care-receiver ages.

Hypothesis #3: The variance-covariance matrices for each of three age stratified groups will be significantly different.

If the variance-covariance matrices differ significantly the elderly persons in the sample should not be treated as a homogeneous group and it is valid to fit the model of the caregiving network to each of three age stratified samples. It is expected that for elderly persons between the ages of 65 and 74 primary caregiving will have the greatest impact on functional impairment and caregiver stress/burden. A majority of the impaired elderly will have a spouse to care for them and little interaction with either the informal or formal networks. As the age of the care-receiver increases, the likelihood that the primary caregiver will be a nonspouse also increases. Thus, many caregivers will be forced to accomplish personal care tasks normally performed within a marital relationship while trying to maintain their own family unit. When the care-receiver is 75 to 84, then, it is expected that the impact of the informal network, and to a lesser degree the formal network, on the endogenous construct referred to as the caregiving network will increase. When the impaired elderly person is 85 or older, the formal network is likely to have a greater impact as potential caregivers approach old age themselves and require assistance to avoid institutionalization.

CHAPTER FOUR
DATA AND METHODOLOGY

A comprehensive empirical analysis of caregiving is dependent on an adequate source of data. Longitudinal data are the optimal choice for research which addresses the impact of caregiving related factors on outcomes linked with institutionalization. Unfortunately, longitudinal data sets currently available that include measures for the elderly are limited in scope and contain little information about the caregiving network. Previous research has utilized relatively small samples to address very specific caregiving related questions. Although in some cases they are representative samples, few have the broad range of measures necessary for the current research. The data set used in this research is the most comprehensive cross-sectional source of data on caregiving currently available.

Data

The data are from the 1982 National Long-Term Care Survey and National Survey of Informal Caregivers. The Long-Term Care Survey was conducted by the Bureau of the Census. Data were collected from a nationally representative sample of 6393 elderly (65 and older) who reported at least one ADL or IADL limitation. In addition to extensive questioning related to the impaired elderly

person's medical condition and social environment, data are available for all household members, helpers, and children. Moreover, a limited number of measures related to formal care are available.

Elderly persons included in the sample for the Long-Term Care Survey were asked to identify individuals who assisted, without pay, in performing at least one instrumental or personal care activity of daily living function. Using the individuals identified as an initial sampling frame, the National Opinion Research Center undertook the National Survey of Informal Caregivers, a supplement to the Long-Term Care Survey. Data were collected from a representative sample of 1924 informal caregivers on topics ranging from the care-receiver's impairments, to economic factors, levels of stress, and their own functional limitations. More importantly, there are numerous measures of specific caregiving related factors.

Each person identified by an impaired elderly person who performed at least one ADL task was included in the sampling frame for the National Survey of Informal Caregivers. As a result, each functionally limited elderly person may have from one to five informal caregivers included in the original sample. In order to identify the primary caregiver when multiple caregivers are in the sample, the individual who provided the most care to the impaired elderly person was retained. This was

accomplished by selecting the caregiver who reported the greatest number of hours per week spent providing caregiving services. Thus, after deleting informal caregivers who were not designated primary caregivers, all those who were neither black nor white, and eliminating outliers in eight cases, the sample used in this research consists of 1387 respondents. These primary caregivers were then matched to the elderly person for whom they provide care.

Analysis Strategy

The model depicted in Figure 3-2 can best be addressed by utilizing a multiple indicator unobserved variable model commonly referred to as a LISREL model. LISREL unites aspects of factor analysis and structural equation modeling to permit the estimation of complex models involving measurement error (Campbell and Mutran, 1983). The LISREL model assumes that imperfectly measured constructs are represented by multiple indicators and allows for reciprocal causation among these constructs (Miller et al., 1984). This analytic technique utilizes two interrelated mathematical models--a measurement model and a structural model--to represent hypothesized theoretical relationships.

The general LISREL model is normally parameterized as:

$$\eta = \beta\eta + \Gamma\xi + \zeta \qquad \text{EQ. \#1}$$

where:

η = a vector of true unobserved endogenous variables

ξ = a vector of true unobserved exogenous variables

β = an M x M matrix of parameters relating endogenous variables to one another

Γ = an M x N matrix of parameters relating the endogenous variables to the exogenous variables

ζ = a vector of errors in equations.

The unobserved theoretical constructs η and ξ are related to the multiple empirical indicators through the following measurement equations:

$$y = \Lambda_y \eta + \epsilon \qquad \text{EQ. \#2}$$

$$x = \Lambda_x \xi + \delta \qquad \text{EQ. \#3}$$

where:

y = a vector of observed endogenous variables

x = a vector of observed exogenous variables

Λ_y = a matrix of "factor" loadings describing the epistemic link (correlations or reliabilities) between the empirical indicator, y_i, and the relevant unobserved endogenous variable, η_i

Λ_x = a matrix of "factor" loadings that describe the epistemic link between the empirical indicator, x_i, and the relevant unobserved exogenous variable, ξ_i

ϵ and δ = vectors or errors of measurement in y and x, respectively. (The values of the parameters reflect error variance in the indicators.)

The unknown parameter matrices are estimated by iteratively minimizing the fitting function:

$F = \log|\Sigma| + tr(S\Sigma^{-1}) - \log|S| - (p - q)$

where:

log = natural logarithm

tr = trace (i.e., sum of diagonal elements)

| | = the determinant of a square matrix (i.e., Σ and S)

Σ = predicted variance-covariance matrix

S = observed sample variance-covariance matrix

p = number of indicators of the endogenous constructs

q = number of indicators of the exogenous constructs

LISREL employs an iterative process that proceeds as follows:

1) Initial estimates of the model parameters are generated by a three stage, least-squares procedure and these values are used to generate a predicted covariance matrix Σ.

2) The predicted covariance matrix Σ is formally compared to the observed sample covariance matrix, S.

3) If the initial set of parameter estimates do not result in S being perfectly reproduced by Σ, a second set of parameter estimates is generated, resulting in a better fit between Σ and S. This process continues until the fit of the specified model structure can no longer be improved.

If Σ does not perfectly reproduce the sample covariance matrix, the parameters that result in the closest fit

represent the maximum likelihood estimates (Miller et al., 1983).

Testing the adequacy of the proposed model fit is generally accomplished by a chi-square goodness of fit test. The value of χ^2 is equal to (N - 1) times the minimum value of the fitting function, F, with df = $\frac{1}{2}p(p+1)-t$ where p is the number of variables and t is the number of unknown parameters to be estimated. Relatively small values of χ^2 indicate that the model closely fits the observed data. With a large sample size the likelihood that the chi-square statistic will be nonsignificant (denoting a good fit) is small. A χ^2 to degrees of freedom ratio of five to one will indicate an acceptable model fit (Wheaton et al., 1977). The root mean square residual is a simple mean of the residuals that gives extra weight to larger residuals by squaring them. Small residuals imply a good fit (Herting and Costner, 1983).

Frequently, the covariance between observed variables is insufficient to construct the unobserved variables necessary for estimating a measurement model. In such instances, the LISREL computer program can be used to estimate a system of simultaneous equations using observed variables. A simultaneous equation model includes endogenous variables, those simultaneously explained by the model, and exogenous or predetermined variables, the explanatory variables.

The general structural form of a simultaneous equation system is: $y_i\Gamma+x_i\beta=\epsilon_i$ EQ. #4

where y_i is a vector of endogenous variables, x_i is a vector of exogenous variables, ϵ_i is a vector of stochastic disturbances, and i=1, 2, ..., n. The β's and Γ's are the structural coefficients. In general, not all endogenous and predetermined variables appear in every equation.

Equation four is often written in a different form by reversing the roles of the coefficient matrices Γ and β. In addition, it is not uncommon to see the system represented as one that premultiplies column vectors of variables. As a result, the equation can also be written in the form: $\beta y_i+\Gamma_i=u_i$. EQ. #5

These simultaneous system equations may not be familiar to many sociologists who are used to single equation systems such as $y=X\beta+\epsilon$. EQ. #6

In the single equation case the structural form of the model is identical to the reduced form. When the model is generalized to include multiple endogenous variables the structural form is given in equation four, but it reduces to equation six when the number of endogenous variables is one. Thus, the structural form for g endogenous variables is: $\underset{nxg}{Y}\ \underset{gxg}{\Gamma} + \underset{nxk}{X}\ \underset{kxg}{\beta} = \underset{nxg}{E}$.

If g=1, this results in the following:

Y collapses to a column vector, y

Γ collapses to a single element

β collapses to a column vector

E collapses to the column vector, -u.

This yields $y(-1)+X\beta=-u$ and, solving for y, you get $y=X\beta+u$. This equation is identical to equation six which has now been shown to include an implicit parameter on y. The estimation of simultaneous equation systems is described in greater depth in several standard texts (see for example, Hanushek and Jackson, 1977; Kmenta, 1986; Intriligator, 1978; Johnston, 1972; Pindyck and Rubinfeld, 1981).

Multiple Group Comparisons

LISREL can be used to analyze data from multiple groups simultaneously. By constraining some or all parameters over G groups, the constrained hypotheses can be statistically tested. In the current research, consider the set of G groups of elderly persons (stratified by age) in which K variables have been measured on N individuals from each population. The model for any given group is defined for the parameter matrices: $\Lambda_y^{(g)}$, $\beta^{(g)}$, $\Psi^{(g)}$, and $\Theta_\epsilon^{(g)}$. Where g = 1,2,3 and each matrix may contain fixed, free, and/or constrained parameters. If any constraints exist among G groups, the data from all groups must be analyzed simultaneously to insure statistically efficient parameter estimates (Joreskog and Sorbom, 1983). In general, any invariance can be tested with no constraints, in which case each group is analyzed

separately, or where all parameters are assumed invariant across groups, in which case data can be pooled.

The most restrictive case occurs when the covariance matrices of the observed variables in G groups are assumed to be equal. The following model tests the validity of this assumption for Y:

Group 1: $\Psi^{(1)} = \Lambda_y^{(1)}\eta^{(1)} + \epsilon^{(1)}$

Where: $\Lambda_y^{(1)} = I$ and $\epsilon^{(1)} = 0$

Hence: $\Sigma^{(1)} = \Lambda_y^{(1)}\Psi^{(1)}\Lambda_y'^{(1)} + \Theta_\epsilon^{(1)}$

Group G: $\Psi^{(g)} = \Lambda_y^{(g)}\eta^{(g)} + \epsilon^{(g)}$

Where: $\Lambda_y^{(g)} = I$ and $\epsilon^{(g)} = 0$

Hence: $\Sigma^{(g)} = \Lambda_y^{(g)}\Psi^{(g)}\Lambda_y'^{(g)} + \Theta_\epsilon^{(g)}$

Now test the equality constraint: $\Psi^{(1)}=\Psi^{(2)}=\Psi^{(3)}$. If the null hypothesis cannot be rejected then the groups are not different and it is appropriate to pool the data. If the null hypothesis can be rejected, then it is appropriate to test various forms of less stringent equalities. In this case, it is possible to test for invariant structural relations by testing: $\beta^{(1)}=\beta^{(2)}=\beta^{(3)}$.

The simultaneous models for the G groups are estimated by minimizing the fitting function:

$$F = \sum_{g=1}^{G} (N_g/N) F_g(\Sigma_g - S_g)$$

Where: $F_g = \log|\Sigma_g| + \mathrm{tr}(S_g\Sigma_g^{-1}) - \log|S_g| - (p + q)$

and N_g = sample size in age group g

$N = N_1 + N_2 + \ldots + N_G$

S_g = sample moment matrix for age group g

Σ_g = population moment matrix for age group g

p = number of y (endogenous) variables

q = number of x (exogenous) variables

and the fitting function is a function of the specified parameter structures in the four matrices Λ_y, β, Ψ, and Θ_ϵ. The interpretation of the various LISREL parameters is presented in chapter six while discussing the fit of the initial caregiver model.

Operationalization of Major Constructs

Caregiving related factors are concentrated in five broad areas suggested by the theoretical model: household and caregiving economics, primary caregiving, the informal network, the formal network, and antecedents to institutionalization. The model proposed here contains twelve unobservable constructs measured by 36 indicators. The complex model of caregiving that will be analyzed is depicted in Figure 3-2. The description of the variables used in this model follows.

Household and Caregiving Economics

The first unobservable construct, η_1, is household and caregiving economics. This construct is measured imperfectly by three indicators: household income, race, and Medicaid status. Each of these indicators has been identified frequently in the caregiving literature as a critical factor affecting the financial viability of the functionally impaired elderly.

Household income. Household income as reported by the elderly care-receiver is the measure used. It originally consisted of 16 categories reflecting income segments from $0 to over $50,000. These categories have been recoded to their mid-point, for ease of interpretation, to create a continuous income measure.

Race. The sample contains only primary caregivers who are black or white. Moreover, in more than 99 percent of the sample, the race of the care-receiver is the same as that of the primary caregiver. Race is a dichotomous variable coded one when the impaired elder is black.

Medicaid status. An additional indicator of household and caregiving economics is the Medicaid status of the elderly care-receiver. Those who receive Medicaid are poorer, but have better access to institutional care when needed. Medicaid is a dichotomous variable coded one when the respondent is a Medicaid recipient.

Caregiving Relationship

The second unobservable construct, η_2, is broadly defined as the caregiving relationship. It is imperfectly measured by six indicators: gender of the caregiver, spousal status, living arrangement, gender of the care-receiver, age of the caregiver, and the effect of caregiving on the caregiver's employment.

Caregiver gender. Caregiver gender is a dichotomous variable coded one when the caregiver is male.

Spousal status. Spousal status is a dichotomous measure coded one when the primary caregiver is a spouse.

Living arrangement. Living arrangement is a dichotomous variable coded one when the caregiver lives with the impaired elderly person in the sample.

Care-receiver gender. Care-receiver gender is a dichotomous variable coded one when the impaired elder is male.

Caregiver age. Caregiver age is a continuous variable ranging from 16 to 94.

Caregiver employment. Primary caregivers were asked whether caregiving had ever precluded a job search, caused them to rearrange their schedule, forced them to take time off, compelled them to work fewer hours, caused them to quit a job, or prevented acceptance of a job. Responses have been recoded into a four value categorical variable that measures the deleterious effect of caregiving on employment. This indicator is coded one if employment has never been affected by caregiving, two if the respondent has rearranged his or her schedule or been precluded from pursuing a job search, three if time off has been taken or fewer hours worked, and four if the respondent has ever quit or failed to accept a job as a direct result of caregiving obligations. Thus, the greater the value, the greater the deleterious effect of caregiving on caregiver employment.

Caregiver Functioning

The third unobservable construct, η_3, is caregiver functioning. Caregiver functioning has two indicators, functional impairment and the subjective perception of overall health.

Functional impairment. Primary caregivers were asked whether they needed help with: eating, getting in and out of bed, getting in and out of chairs, getting around inside, going outside, dressing, bathing, using the toilet, or with incontinence. Affirmative responses were summed creating an index ranging from zero to nine. Thus, the greater the value, the greater the functional impairment. Use of these measures in this fashion assumes equal weights on each task, a choice consistent with similar research.

Subjective health. The second indicator is the primary caregiver's subjective perception of their own health. Values range from one to four such that the greater the value, the more positive the caregiver's self-perception of health.

Primary Caregiving

The fourth unobservable construct, η_4, is primary caregiving. This construct is determined by two exogenous constructs, the caregiving relationship (η_2) and caregiver functioning (η_3), and three additional single-item indicators. These indicators are: length of caregiver

commitment, total hours of caregiving, and caregiver affection.

Length of commitment. Length of caregiving is a continuous variable that reflects the total length of time in years the primary caregiver has cared for the impaired elder because of his or her disability. Length of caregiving ranges from one to 44 years.

Total hours. Total hours of caregiving reflects the number of extra hours in an average day the primary caregiver spends helping the care-receiver. Values range from zero to 24.

Affection. Affection is measured by the subjective response of the primary caregiver when asked how good helping the care-receiver made them feel. It is a continuous variable with original responses ranging from zero to one million. Respondents were asked to compare their feelings relative to a 100 point scale. Thus, the greater the value, the greater the affection felt by the caregiver for the care-receiver. Because responses were highly right-skewed, a log transformation was performed on the data. This logged variable will be used in subsequent analyses.

Formal Network

The fifth unobservable construct, η_5, is the formal network. It is imperfectly measured by five indicators: the length of paid assistance, the number of paid helpers,

the total days the impaired elder receives paid help, the number of activity of daily living functions performed by paid helpers, and the number of instrumental activities of daily living performed by paid helpers.

Length of assistance. This indicator is an imprecise measure of the longevity of helping services provided by paid helpers. As with unpaid helpers, it is a categorical variable that addresses how long a helper has helped because of the care-receiver's impairment. Responses are summed across all unpaid helpers who assist the care-receiver with their disability. Values range from zero to 13.

Paid helpers. This indicator is simply a summation of the number of paid helpers who assist with either a personal care or instrumental task. Values range from zero to seven.

Paid days. The number of paid days is a continuous variable ranging from zero to 20. It is constructed by summing the number of days per week that all paid helpers provide assistance to the functionally impaired elder.

Paid ADL's. This is a measure of the number of activity of daily living functions performed by paid helpers. Values range from zero to six.

Paid IADL's. The number of instrumental activity of daily living functions is a continuous variable ranging from zero to 18. It measures the number of IADL functions performed by paid helpers.

Network Size

The sixth unobservable construct, η_6, is network size. This construct is imperfectly measured by three indicators: household size, number of children, and number of helpers.

Household size. Household size is a continuous variable ranging from one to 12. The care-receiver is included in this count.

Number of children. Number of children is a continuous variable ranging from one to 13.

Number of helpers. Number of helpers is a continuous variable ranging from one to 11. It includes all those who help with at least one ADL or IADL task. It may include household members.

Frequency of Contact

Frequency of contact is the seventh unobservable construct, η_7, and is imperfectly measured by four indicators: visits with relatives, telephone conversations with relatives, visits with friends, and telephone conversations with friends.

Visits with relatives. Visits with relatives is a five-item categorical variable that reflects the number of times relatives have visited the impaired elder in the past month. The frequency of visitation is indicated by responses which range from none, once, or twice for value

one, to thirty or more times for value five. The cut-points were precoded in the data.

Conversations with relatives. This indicator is also a five-item categorical variable ranging from one to five. Responses are the same as above.

Visits with friends. Visits with friends reflects the number of times friends have visited in the past month. Values are the same as for relatives.

Conversations with friends. Conversations with friends is a five-item variable that reflects the number of conversations the impaired elder had with friends in the past month. Responses are the same as above.

Durability

Durability is the eighth unobservable construct, η_8. It is measured by four indicators: length of commitment, number of helping days, number of personal care tasks fulfilled, and the number of instrumental tasks fulfilled by the informal network.

Length of commitment. This indicator is an imprecise measure of the longevity of helping services provided by helpers. A categorical variable that addresses how long a helper has helped because of the care-receiver's impairment is used with values ranging from one to five, less than three months to five or more years. Responses are summed across all helpers who assist the care-receiver with their disability. Values range from zero to 30.

Number of helping days. This variable reflects the number of helper days provided to the care-receiver in the last week. It is derived by summing the number of days in the week prior to the interview that each helper helped the impaired elder because of their impairment. Because numerous helpers may be available, several "helper days" may be accounted for in a single day of the week. Values range from zero to 42 such that the greater the value, the greater the total helping days.

Number of ADL tasks. This variable was constructed by summing the number of personal care tasks performed by an unpaid helper. A continuous variable was created with values ranging from zero to nine. More than one helper may assist in accomplishing a single task.

Number of IADL tasks. The measurement of instrumental tasks was created by summing the number of IADL functions performed by unpaid helpers. It is a continuous variable ranging from zero to 25. Again, more than one helper may assist in fulfilling a particular need.

Informal Network

The ninth unobservable construct, η_9, is the informal network. It is a function of three exogenous constructs, network size (η_6), frequency of contact (η_7) and durability (η_8). In addition, two single-item indicators, reciprocity and urbanness, are used to estimate the informal network.

Reciprocity. Reciprocity has values ranging from one to five and reflects specific tasks the care-receiver does for the caregiver. The specific items are: household chores, babysitting, money gifts, keeping company and helping in other ways. The measure ranges from one to six such that the greater the value, the more the care-receiver reciprocates.

Urbanness. This indicator denotes the urbanness or ruralness of the impaired elder's place of residence. It has six values ranging from open farm to large city such that the greater the value, the more urban the environment.

Functional Impairment

The eleventh unobservable construct, η_{11}, is functional impairment. It has two indicators: ADL and IADL impairments.

ADL impairments. This indicator measures the total number of activity of daily living impairments experienced by the elderly individual. It is a continuous variable ranging from zero to six.

IADL impairments. Values for IADL impairments range from zero to nine. This variable measures the total number of instrumental activity of daily living impairments such that the greater the value, the greater the functional impairment.

Stress and Burden

The twelfth unobservable construct, η_{12}, is stress/burden. It has two indicators: caregiver stress and long term feelings of burden.

Stress. Stress is a one item indicator that measures the primary caregiver's self-reported perception of stress. Its values range from zero to 100,000. Respondents compared their self-perceived stress to a 100-point scale when asked how much stress is caused by helping the care-receiver. Because responses are highly right-skewed, a log transformation was performed on the data. This transformed variable will be used in the analysis.

Burden. This indicator is the sum of eleven burdens that caregiving creates for the primary caregiver. These burdens range from embarrassment caused the primary caregiver by the impaired elder to worsened health caused by caregiving. Thus, it is a continuous measure with values ranging from zero to nine.

Summary

The general model contains 36 variables. With the exception of affection and stress, whose distributions are highly skewed, missing values will be set to the mean when the data are estimated by LISREL so as to include all respondents in the analysis. Missing values on affection and stress have been set to their respective median values.

CHAPTER FIVE
AGE HETEROGENEITY AND THE CAREGIVING NETWORK

The difficulties associated with providing care to the functionally limited elderly have received increased attention in recent years, yet little is known about how these problems are exacerbated by increasing age of the care-receiver. Defining the stages of caregiving (Clark and Rakowski, 1983), determining the structure of the caregiving network available at different life cycle stages (Sangl, 1985), and targeting intervention strategies to age-specific populations of functionally limited elderly persons have been identified as areas in which research is lacking. None of these agendas can be carried out, however, without a better understanding of differences among age cohorts.

This chapter addresses the hypothesis that there are differences in characteristics of the caregiving network by age of the care receiver. Nearly all research on elderly persons generally, and caregiving specifically, treats the aged as a homogeneous group despite the fact that the literature shows that differences should exist. To the extent that dissimilarities in the caregiving networks of age stratified samples of functionally limited elderly people are found, policies, academic agendas, and

intervention strategies can be formulated to deal with age-specific needs of functionally impaired elderly people and their caregivers.

The Functionally Impaired Elderly

Table 5-1 delineates characteristics of functionally limited elderly people by age category. Table 5-1 and subsequent tables present data for the total sample, those 65 to 74, 75 to 84, and 85 and older. For ease of presentation these age categories will frequently be referred to as the old, the old old, and the oldest old, commensurate with common usage in the gerontological literature. In each table, sample sizes are shown in parentheses. The chi-square statistic for cross-tabulations and the F-statistic for analysis of variance are reported as appropriate. For the latter, means for the old old and the oldest old are compared to the mean for the 65 to 74 age group (the old). Significance is reported at the $p<.001$, $p<.01$, and $p<.05$ levels.

Table 5-1 shows that slightly more than 60 percent of the sample is female, consistent with expectations given the greater life expectancy of women. Moreover, the increase in the proportion of women as age increases is significant at the $p<.001$ level. Thus, while 53 percent of those 65 to 74 are female, over 60 percent of the old old and 72 percent of the oldest old are women.

Table 5-1: Characteristics of the Impaired Elderly by Age Cohort

Characteristics	Total	65-74	75-84	85+
GENDER:***				
Male	39.9	46.8	39.3	27.3
Female	60.1	53.2	60.7	72.7
	(1387)	(579)	(511)	(297)
RACE:*				
White	87.1	85.1	90.2	85.5
Black	12.9	14.9	9.8	14.5
	(1387)	(579)	(511)	(297)
MARITAL STATUS:***				
Married	71.7	77.6	72.0	59.9
Unmarried	28.3	22.4	28.0	40.1
	(1387)	(579)	(511)	(297)
LIVING ARRANGEMENT:**				
Alone	19.2	15.4	20.7	23.9
With Others	80.8	84.6	79.3	76.1
	(1387)	(579)	(511)	(297)
URBANNESS:				
Open Country	13.3	16.4	13.1	7.4
Farm	7.2	6.5	6.7	9.4
Under 50,000	38.4	37.5	39.5	38.4
City/50-250,000	18.6	18.5	18.4	19.2
Suburb to City	8.0	7.7	8.4	8.1
Large City	14.5	13.4	13.9	17.5
	(1381)	(573)	(511)	(297)
HOUSEHOLD INCOME:	12789.97	11556.91	12944.44*	15006.17***
	(1176)	(492)	(441)	(243)
MEDICAID:				
Yes	21.6	20.2	21.1	25.2
No	78.4	79.8	78.9	74.8
	(1387)	(579)	(511)	(297)
ADL IMPAIRMENTS:				
Eating***	29.9	25.4	29.4	39.4
In/Out of Bed	60.6	60.1	60.5	62.0
Move Inside*	70.2	66.7	70.9	76.1
Dressing	59.1	57.7	59.9	60.6
Bathing***	84.9	80.8	87.1	88.9
Toilet Use	54.2	51.0	55.4	58.6
Mean Impairments	3.59	3.42	3.63	3.86***
	(1387)	(579)	(511)	(297)

Table 5-1--continued

Characteristics	Total	65-74	75-84	85+
IADL IMPAIRMENTS:				
Heavy Work	93.7	93.3	93.4	95.3
Light Work***	54.7	48.4	57.5	62.0
Laundry***	75.7	68.7	78.5	84.5
Meals***	65.5	57.3	68.3	76.8
Shopping***	82.0	73.8	85.7	91.6
Move Outside***	75.6	70.1	79.7	79.1
Walking*	63.3	59.1	66.0	67.0
Managing Money***	51.7	42.7	55.0	63.6
Telephoning***	35.1	22.5	39.3	52.5
Mean Impairments	5.97	5.36	6.23***	6.72***
	(1387)	(579)	(511)	(297)

NOTE: Significance tests for columns two thru four are based on the chi-square statistic for cross-tabulations. The F-statistic for analysis of variance is used for comparing mean differences. Means for those 75 to 84 and those 85 and older are compared to the mean for the 65 to 74 age category. Sample sizes are in parentheses.

* denotes significance at the $p < .05$ level.

** denotes significance at the $p < .01$ level.

*** denotes significance at the $p < .001$ level.

Proportional differences by age category also exist by race of the elderly care-receiver. Nearly 13 percent of the total sample is black, but the proportion of functionally limited elderly persons who are black is significantly lower among those 75 to 84 than in either of the other age groups. This finding suggests that the real crisis for functionally limited elderly blacks occurs between the ages of 75 and 84. The lower proportion found here may suggest that a disproportionate number of blacks in this age category are institutionalized or, alternatively, receive no home care assistance. Given the inverse relationship between nonwhite population size and institutionalization (Kart and Beckham, 1976) the latter explanation appears more appropriate.

Marital status is statistically significant at the $p<.001$ level as expected. While over 28 percent of the total sample is unmarried, the proportion increases from 22.4 percent of those 65 to 74, to 28 percent of the old old and to 40.1 percent of the oldest old. The high proportion of women, coupled with the comparatively low proportion of unmarried persons over 85, suggests that the functionally limited elderly who remain in the community do so in part because they have a marital partner to rely on.

The proportion of the functionally impaired elderly who live alone increases from 15.4 percent of the old to 20.7 percent of the old old and nearly 24 percent of those 85 and older. The majority of the oldest old living alone are

women. Thus, females who are 85 or older are likely to be in greatest need of assistance from the informal and formal sectors of the caregiving network.

The distribution of urbanness does not differ significantly by age of the care-receiver. Slightly over 20 percent of elderly persons in the sample live in open country or on farms, 57 percent live in small towns or cities, and 22.5 percent live in large cities or suburban areas. Differences by age cohort are not significant.

Care-receiver income is significantly different by age category. The oldest old have a mean income $2062 higher than the old old and nearly $3450 higher than those 65 to 74. This finding indicates that the functionally limited elderly who are over 85 may be capable of avoiding institutionalization if funds are available to provide alternative sources of care. It may also suggest that elderly persons still in the community at advanced ages are benefitting from cumulative life style and social advantages which are reflected in higher incomes.

There are no significant differences by age category in receipt of Medicaid. Slightly more than 21 percent of the total sample received Medicaid benefits at the time they were interviewed. The proportion of Medicaid recipients is slightly greater among the oldest old.

The proportion of the functionally limited elderly who experience each of the six activity of daily living (ADL) impairments included in this analysis increases with age as

expected. Moreover, there are no differences in the mean number of impairments between those 65 to 74 and the old old, but the oldest old have significantly more ADL limitations than both. However, not all impairments are significantly different. Nearly 61 percent of the functionally limited elderly in the sample have trouble getting in and out of bed, 59 percent have difficulty dressing, and 54 percent have trouble using the toilet. The proportion of functionally impaired elderly persons experiencing these limitations does not differ by age category.

There are differences by age category in eating, moving around inside, bathing, and mean number of impairments. Eating is significant at the $p<.001$ level and is a problem for 39.4 percent of the oldest old, compared to 29.4 and 25.4 percent of the old and the old old respectively. Likewise, the proportion of elderly people experiencing difficulty moving around inside increases from nearly 67 percent of those 65 to 74, to 70.9 percent of the old old, and over 76 percent of the oldest old. In addition, the proportion of elderly persons 75 to 84 and 85 and older who have difficulty bathing is significantly greater than for those 65 to 74. Of particular interest is that the three ADL impairments that are significantly different by age category are activities for which it is potentially more difficult to improvise remedies. For example, while a bed pan or a portable toilet might solve a problem with toilet

use, it is much more difficult to provide easy access to a warm bath or eating assistance.

The proportion of elderly persons who have each of nine activity of daily living (IADL) impairments is significantly different across age categories with one exception, assistance with heavy work. Nearly 94 percent of the total sample needs help performing heavy work. Nevertheless, differences by age category are statistically significant at the $p<.001$ level for the proportion of those needing help with light work, laundry, meals, shopping, moving around outside, managing money, and using the telephone, and at the $p<.05$ level for the proportion of those requiring assistance with walking. In addition, the mean number of IADL impairments is significantly greater for the old old and the oldest old than for those 65 to 74.

The consistent pattern is the greater the age category of the care-receiver, the greater the proportion of impaired elderly who have a particular functional limitation. For example, 22.5 percent of those 65 to 74 have trouble with the telephone, while 39.3 percent of the old old and 52.5 percent of the oldest old experience this impairment. On the other hand, the proportion of elderly persons experiencing problems moving around outside is consistently high, but significantly greater among the old old and the oldest old.

Caregivers of the Functionally Impaired Elderly

There are multiple differences in characteristics of primary caregivers who care for the functionally limited elderly in the sample. Table 5-2 shows these dissimilarities by age category of the care-receiver. For example, the proportion of primary caregivers who are female increases from 64.4 percent for those 65 to 74, to 76.7 percent of the old old, and 81.8 percent of the oldest old. This increase in the proportion of females reflects the increased likelihood that children, most often daughters or daughters-in-law, will become primary caregivers as the elderly person ages.

The pattern for differences by race among primary caregivers is similar to that noted earlier. This is because in nearly all cases the race of the caregiver and care-receiver are the same.

The difference in the proportion of primary caregivers caring for a spouse is significant at the $p<.001$ level and decreases from nearly 64 percent of those who care for an elderly person 65 to 74, to 41.3 percent of the old old, and 15.8 percent of the oldest old. This pattern is, of course, to be expected. However, in each category, there are fewer impaired elderly persons being cared for by a primary caregiver who is a spouse than are actually married (refer to Table 5-1). This suggests that in some cases both the elderly person in the sample and their spouse are impaired to such an extent that they require the assistance

Table 5-2: Characteristics of the Primary Caregiver by Age Cohort of the Care-Receiver

Characteristics	Total	65-74	75-84	85+
GENDER:***				
Male	27.3	35.6	23.3	18.2
Female	72.7	64.4	76.7	81.8
	(1387)	(579)	(511)	(297)
RACE:*				
White	86.9	84.6	90.4	85.2
Black	13.1	15.4	9.6	14.8
	(1387)	(579)	(511)	(297)
SPOUSAL STATUS:***				
Spouse	45.3	63.9	41.3	15.8
Nonspouse	54.7	36.1	58.7	84.2
	(1387)	(579)	(511)	(297)
AGE:	61.86	61.13	62.16	62.78
	(1387)	(579)	(511)	(297)
EMPLOYMENT:				
No Effect	72.8	73.8	73.2	70.0
Rearrange	10.1	9.1	10.8	10.8
Time Off	8.8	9.2	8.4	9.1
Quit	8.3	7.9	7.6	10.1
	(1387)	(579)	(511)	(297)
LENGTH:	6.86	7.39	6.27**	6.81
	(1357)	(566)	(502)	(2.89)
HOURS OF CARE:	4.47	4.31	4.46	4.80
	(1334)	(559)	(490)	(285)
AFFECTION (Logged):	6.22	6.19	6.18	6.33
	(1293)	(540)	(475)	(278)
STRESS (Logged):	4.70	4.51	4.76*	4.99**
	(1317)	(554)	(485)	(278)
FUNCTIONAL IMPAIRMENTS:				
Eating	0.4	0.5	0.2	0.3
In/Out of Bed	3.0	3.3	2.9	2.4
In/Out of Chairs	3.4	4.0	2.9	3.0
Walking Inside	2.9	3.5	2.2	3.0
Help Outside	3.4	3.1	3.5	3.7
Dressing	1.4	1.6	1.4	1.0
Bathing	1.1	1.2	1.0	1.0
Toilet Use	0.4	0.5	0.4	0.0
Bowel/Bladder	4.2	4.5	4.3	3.4

Table 5-2--continued

Characteristics	Total	65-74	75-84	85+
FUNCTIONAL IMPAIRMENTS: (continued)				
Mean Impairments	0.20	0.22	0.19	0.18
	(1387)	(579)	(511)	(297)
SUBJECTIVE HEALTH:**				
Poor	9.9	13.6	6.3	9.1
Fair	27.9	27.3	29.2	26.9
Good	41.5	40.9	42.3	41.1
Excellent	20.7	18.1	22.3	22.9
	(1387)	(579)	(511)	(297)
BURDEN:				
Uncooperative***	60.9	49.9	67.1	71.7
Embarrassing**	20.0	16.1	24.3	20.2
Senility***	25.2	15.4	31.7	33.3
Yells	37.1	38.2	37.8	34.0
No Privacy***	25.2	19.5	28.0	31.3
Social Limits***	51.1	44.7	54.4	57.9
Constant Need**	33.0	28.8	34.1	39.1
Worse Health	18.0	17.4	17.8	19.2
Too Costly	19.1	19.2	21.1	15.5
Mean Burden	2.90	2.49	3.16***	3.22***
	(1387)	(579)	(511)	(297)

NOTE: Significance tests for columns two thru four are based on the chi-square statistic for cross-tabulations. The F-statistic for analysis of variance is used for comparing mean differences. Means for those 75 to 84 and those 85 and older are compared to the mean for the 65 to 74 age category. Sample sizes are in parentheses.

* denotes significance at the $p < .05$ level.

** denotes significance at the $p < .01$ level.

*** denotes significance at the $p < .001$ level.

of a nonspouse primary caregiver. In most cases, it is likely to be a daughter or daughter-in-law.

The mean primary caregiver age for the total sample is nearly 62 years and does not vary by age category of the care-receiver. There are also no significant differences in the effect of caregiving on the employment status of the primary caregiver, although the tendency is for there to be a greater impact on caregivers caring for the oldest old. Nevertheless, it is important to note that while for nearly 73 percent of the sample caregiving had no effect on employment, 10.1 percent of primary caregivers rearranged their schedule, 8.8 percent took time off to care for the impaired elder in the sample, and 8.3 percent quit or failed to accept a job due to caregiving responsibilities. This supports the conclusions of others who have found that caregiving has a deleterious effect on the employment of primary caregivers, particularly women.

Primary caregivers in this sample have been providing caregiving services for an average of 6.86 years. However, there are differences by age category of the elderly care-receiver. Those in the 65 to 74 age category have been caregivers for 7.39 years, while primary caregivers of the old old and the oldest old have been primary caregivers for 6.27 and 6.81 years, respectively. This finding reflects the greater likelihood that children, who may have replaced a spouse or other caregiver, are the most likely to care for the old old and oldest old.

Neither hours of caregiving each day nor affection vary by age. Primary caregivers provide an average of 4.47 hours of care and generally express a great deal of affection for the elderly person for whom they care. Level of stress expressed by primary caregivers varies by age of the care-receiver. Caregivers of those 65 to 74 have the lowest stress levels followed by primary caregivers of the old old and the oldest old. In general, caregivers tend to experience a great deal of stress as a result of providing caregiver services to the functionally disabled elderly.

The proportion of primary caregivers who experience any functional impairment is very low. None are significant by age category. The mean functional impairments for the total sample is .20. Getting in and out of bed, getting in and out of chairs, walking inside, help outside, and bowel and bladder problems are the most common impairments. However, bowel and bladder problems, the most common impairment, is experienced by only 4.2 percent of primary caregivers.

Differences in the subjective perception of health reported by primary caregivers differs significantly at the $p<.01$ level. The proportion of primary caregivers of the old old and the oldest old reporting excellent health is greater than for caregivers of elderly people 65 to 74. This finding is probably due to the fact that caregivers of the old old and the oldest old are more likely to be children rather than spouses.

Six of nine burdens experienced by primary caregivers are significantly different by age category. Nearly 50 percent of those who care for impaired elders 65 to 74 feel they are uncooperative, while this is true for 67.1 percent of caregivers of the old old and 71.7 percent of caregivers of the oldest old. The proportion reporting senility as a problem more than doubles from 15.4 percent of those 65 to 74, to 31.7 percent of the old old, and 33.3 percent of the oldest old. Moreover, embarrassment is a burden for 24.3 percent of primary caregivers of the old old, while this is true for only 16.1 and 20.2 percent of caregivers of the old and the oldest old, respectively.

The proportion reporting that caregiving impinges on privacy, creates social limitations, and that the impaired elderly person requires constant attention increases significantly by age category. In each case, the proportion of primary caregivers experiencing each burden increases by age of the care-receiver. The proportion of primary caregivers reporting that yelling, worsened health, and the costs of caregiving are burdensome does not differ by age category. Over 37 percent of the total sample report yelling as a problem, 18 percent worsened health, and 19.1 percent that caregiving is too costly. Finally, although the mean burdens for the total sample is 2.90, primary caregivers of the old old and the oldest old experience significantly more burdens than do primary caregivers of those 65 to 74.

Characteristics of the Informal Support Network

Table 5-3 reports findings related to the characteristics of the informal caregiving network. Household size increases significantly by age category. Mean household size of impaired elderly persons 65 to 74 is 2.36, for the old old 2.51, and for the oldest old 2.68. This finding is probably due to the greater likelihood that a spouse will not be present in old age and housing will be shared with a child who has his or her own family in residence.

The mean number of children for the total sample is 2.32, but their are no differences by age category. The mean number of helpers increases from 2.11 for those 65 to 74, to 2.26 for the old old, and 2.34 for the oldest old. Only the mean for the latter is significantly different from that for the comparison group. Since the number of informal, unpaid helpers increases for the oldest old while the number of children remains constant (or perhaps even drops slightly), it is likely that friends, neighbors, and other relatives participate in caregiving more frequently when the care-receiver is older.

While four percent of the impaired elderly babysit children of the primary caregiver, 24.7 percent provide occasional monetary gifts, and 2.4 percent accomplish other helpful tasks. Neither of these reciprocal activities varies by age of the care-receiver. However, there are

Table 5-3: Characteristics of the Informal Support Network

Characteristics	Total	65-74	75-84	85+
HOUSEHOLD SIZE:	2.48	2.36	2.51*	2.68***
	(1387)	(579)	(511)	(297)
# OF CHILDREN:	2.32	2.48	2.24	2.18
	(1387)	(579)	(511)	(297)
# OF HELPERS:	2.21	2.11	2.26	2.34*
	(1387)	(579)	(511)	(297)
RECIPROCITY:				
Chores**	31.4	35.6	30.5	24.6
Babysitting	4.0	5.0	3.9	2.4
Gift of Money	24.7	24.4	25.8	23.6
Keeps Company***	67.1	73.6	65.0	58.3
Feels Useful**	75.7	79.1	75.3	69.7
Other	2.4	2.8	2.0	2.4
Mean Reciprocity	2.05	2.20	2.03*	1.81***
	(1387)	(579)	(511)	(297)
RELATIVE'S VISITS PER MONTH:				
0 - 2	23.8	22.0	23.9	27.2
3 - 5	16.9	16.8	16.7	17.6
6 - 10	12.3	11.7	12.5	13.0
11 - 29	20.2	22.9	19.7	15.7
30+	26.8	26.6	27.3	26.4
RELATIVE'S CALLS PER MONTH:***				
0 - 2	34.5	27.0	34.3	50.2
3 - 5	14.9	14.4	16.7	12.6
6 - 10	11.3	13.7	8.8	11.1
11 - 29	17.3	18.5	18.2	13.0
30+	22.0	26.3	22.0	13.0
FRIEND'S VISITS PER MONTH:***				
0 - 2	24.9	20.3	28.9	27.8
3 - 5	20.2	17.7	21.4	24.1
6 - 10	15.2	16.3	12.6	17.8
11 - 29	19.7	19.6	19.3	20.4
30+	20.0	26.1	17.8	10.0
FRIEND'S CALLS PER MONTH:***				
0 - 2	43.9	33.1	49.9	57.6
3 - 5	14.8	16.1	13.9	13.6
6 - 10	14.3	18.3	11.1	11.5
11 - 29	13.4	17.9	10.8	7.9
30+	13.6	14.6	14.4	9.4

Table 5-3--continued

Characteristics	Total	65-74	75-84	85+
LENGTH:	7.29 (1387)	6.95 (579)	7.40** (511)	7.76*** (297)
DAYS HELPING:	8.97 (1387)	8.34 (579)	9.19** (511)	9.79*** (297)
# OF ADL TASKS:	1.45 (1387)	1.39 (579)	1.47 (511)	1.56** (297)
# OF IADL TASKS:	6.33 (1387)	5.62 (579)	6.65*** (511)	7.15*** (297)

NOTE: Significance tests for columns two thru four are based on the chi-square statistic for cross-tabulations. The F-statistic for analysis of variance is used for comparing mean differences. Means for those 75 to 84 and those 85 and older are compared to the mean for the 65 to 74 age category. Sample sizes are in parentheses.

* denotes significance at the $p < .05$ level.

** denotes significance at the $p < .01$ level.

*** denotes significance at the $p < .001$ level.

differences in whether chores, keeping company, or making the primary caregiver feel useful are accomplished. Over 35 percent of impaired elderly persons 65 to 74 perform some chores while this is true for only 30.5 percent of the old old and 24.6 percent of the oldest old. Likewise, 73.6 percent of primary caregivers of the old say that the impaired elder keeps them company, while only 65 percent of caregivers of the old old and 58.3 percent of caregivers of the oldest old feel the same. Finally, while three-fourths of all primary caregivers say that the impaired elderly person for whom they care makes them feel useful, the proportion declines with the increased age of the care-receiver.

There are no significant differences in the number of visits by relatives per month. Approximately one-quarter of the total sample receives 0-2 visits while another 26.8 percent receive 30 or more visits. The number of telephone calls received from relatives by the functionally impaired elder is significantly different across age categories. Over 50 percent of those 85 and older receive 0-2 telephone calls from relatives per month compared to 27 percent of those 65 to 74. One explanation is that the ability to hear declines with age, making conversation difficult and frustrating. The general pattern is the greater the age category, the less the proportion of impaired elders receiving multiple telephone calls from relatives.

The number of visits by friends is significantly different by age category. Essentially, the greater the age category, the lower the proportion of elderly people receiving multiple visits by friends. For example, while 26.1 percent of the impaired elderly 65 to 74 receive 30 or more visits by friends per month, this is true for only 17.8 percent of the old old and 10 percent of the oldest old. The number of telephone calls by friends is also statistically significant at the $p<.001$ level. The pattern is the same as for visits by friends. These findings are probably due to the fact that as age of the functionally impaired elderly increases, the number of their friends who are still alive declines rapidly.

The difference in length of caregiving by the informal network is significant for both the old old and the oldest old, although the actual value is difficult to interpret. The number of helping days provided by the informal network is statistically significant at the $p<.001$ level and increases from 8.34 days for those 65 to 74, to 9.19 and 9.79 days for the old old and the oldest old, respectively. The number of ADL tasks performed by the informal network is significantly different for the oldest old. The mean number of ADL impairments increases from 1.39 for those 65 to 74, to 1.47 of the old old, and 1.56 of the oldest old. Likewise, the number of IADL tasks performed by the informal network increases by age category. When the impaired elder is 65 to 74 the informal network

accomplishes 5.62 tasks, while for the old old it is 6.65, and for the oldest old, 7.15.

Characteristics of the Formal Support Network

Table 5-4 reports findings related to the characteristics of the formal caregiving network. None of the indicators of the formal network are significantly different across age categories. The mean length of caring, although difficult to interpret, is 0.75. The average number of paid days of care each week is 0.66. The mean number of paid helpers available to the impaired elderly through the formal network is 0.26. Finally, the mean number of ADL and IADL tasks performed by the formal network are 0.13 and 0.39, respectively.

Discussion

Cantor (1983, p.597) has argued that "the homogenization of such crucial variables as type of relationship, sex, age, health, and work status of caregivers" obscures differences in the caregiving network. In exposing dissimilarities in caregiving related variables by age of the care-receiver, the purpose is to facilitate the targeting of specific needy subpopulations with the most appropriate assistance. Many of the findings in this chapter are consistent with previous research, although there are also many interesting differences. The reader should remember that the sample used in this research

Table 5-4: Characteristics of the Formal Support Network

Characteristics	Total	65-74	75-84	85+
LENGTH OF CARING:	0.75 (1387)	0.68 (579)	0.75 (511)	0.90 (297)
# OF PAID DAYS:	0.66 (1387)	0.61 (579)	0.62 (511)	0.83 (297)
# OF PAID HELPERS:	0.26 (1387)	0.25 (579)	0.26 (511)	0.29 (297)
# OF ADL TASKS:	0.13 (1387)	0.10 (579)	0.13 (511)	0.16 (297)
# OF IADL TASKS:	0.39 (1387)	0.34 (579)	0.38 (511)	0.49 (297)

NOTE: Significance tests for columns two thru four are based on the chi-square statistic for cross-tabulations. The F-statistic for analysis of variance is used for comparing mean differences. Means for those 75 to 84 and those 85 and older are compared to the mean for the 65 to 74 age category. Sample sizes are in parentheses.

* denotes significance at the $p < .05$ level.

** denotes significance at the $p < .01$ level.

*** denotes significance at the $p < .001$ level.

consists of elderly persons with at least one functional limitation and their primary caregiver. Some outcomes that are at odds with the caregiving literature are a result of analyzing this rather unique sample.

Streib (1983) asserts that the frail elderly have been neglected in sociological research, despite their contribution to the $155 billion in health care spent on the elderly in 1980 (Soldo, 1980). The present results show that those 85 and older experience a greater number of functional impairments, yet are more likely to be unmarried, female, and live alone. The consistency of differences across age categories suggests that the provision of ADL and IADL assistance by the formal and informal networks may be more effective on a macro level if funds for such services were allocated based on the age distribution of the functionally limited elderly population.

Primary caregivers of the old old and the oldest old are more likely to be female, nonspouses, experience more stress, be in better health, and express a greater number of caregiving related burdens. These results are probably linked to the greater likelihood that female children have primary caregiving responsibilities at a time when the functionally impaired elderly require more assistance. There appears to be some validity to the assertion of Osterbusch et al. (1986) who suggest that "family care" and "informal support" are simply euphemisms for female family

members. As a result, the characterization of elderly female caregivers as "hidden patients" (Crossman et al., 1981) appears to be accurate. Conversely, the increased proportion of nonspouse caregivers in the older age cohorts calls into question the characterization of adult-child daughters and daughters-in-law who provide caregiving services as "women in the middle" (Brody, 1981). Adult-child caregivers for elderly persons 75 and older are likely to have no children still living at home.

In some cases, results from the analysis of the informal network are revealing. Household size and the number of helpers increase by age of the care-receiver and the ability of the care-receiver to reciprocate decreases. On the other hand, relative's and friend's call and friend's visit more often when the care-receiver is 65 to 74. While this may indicate a decline in the number of friends and relatives available to call or visit, it may also suggest that they maintain less contact as a result of increasing care-receiver functional impairments. When dealing with more specific measures of commitment, however, the length of unpaid caregiving, number of unpaid helping days and number of ADL and IADL tasks performed by the informal network increase by age cohort of the care-receiver. The analysis of the caregiving network in subsequent chapters should shed light on these relationships.

Surprisingly, several variables identified in previous caregiving research and thought to vary by age of the care-receiver do not. For example, there are no differences in living arrangement, age, employment status, total hours of care, and functional impairments of the primary caregiver by care-receiver age. These factors may be more closely related to the onset of impairment rather than age.

The most important finding reinforces the extensive role that nonspouse caregivers, usually women, play in helping impaired elderly persons avoid institutionalization. The proportion of married elderly care-receivers ranges from 77.6 percent for those 65 to 74, to slightly less than 60 percent for those 85 and older. At the same time, the proportion of nonspouse primary caregivers increases from 36.1 percent of those 65 to 74, to 84.2 percent for the oldest old. These results indicate that at most, only 82.3 percent of primary caregivers for those 65 to 74 and less than one-third of primary caregivers for care-receivers 85 and older are spouses. In other words, the primary caregiver of the respondent in the sample is very likely providing caregiving services for two functionally impaired elderly persons rather than one. Some primary caregivers may be providing multiple services to two functionally limited elderly persons that many caregivers find overwhelming with only one.

Summary

Although there is uniformity in the formal support network across age stratified subsamples, the preceding analysis reveals contrasts in characteristics of impaired elderly persons, primary caregivers, and the informal support network. Results support the hypothesis that there are dissimilarities in the caregiving network by age of the care-receiver. Research, policies, and intervention strategies that address the problems of the aged should be designed so that they take into account the heterogeneity of the rapidly expanding impaired elderly population.

CHAPTER SIX
MODELING THE CAREGIVING NETWORK

In chapter three the conceptual relationships between caregiving related variables were depicted for pedagogical purposes (Figure 3-2). These relationships were established based on the interpretation of previous research and a review of the literature. As noted earlier, the conceptual and empirical difficulty is that research to date has not interconnected variables associated with the caregiving network in a comprehensive fashion. Thus, the relationships established in Figure 3-2 should be viewed as tentative inasmuch as they are based on research that typically utilizes small purposive samples and focuses on causal relationships among a limited number of variables.

This chapter addresses the hypothesis that the comprehensive conceptual model described in chapter three will fit the data. Due to its complex nature and the limited research on some relationships, refinement of the model is expected. Nevertheless, the underlying purpose of the model is to identify those variables and relationships that accurately portray the caregiving network. The result will be useful in identifying how specific caregiving related factors are interrelated and have an effect on the

maintenance of the functionally limited elderly and the mediation of caregiver stress/burden.

Reformulation of the Caregiving Model

The initial analysis of data revealed that LISREL, the multiple indicator unobserved variable model described in chapter four, could not be used to analyze the data as originally intended. The reason has little to do with the limitations of LISREL. Although this outcome can sometimes be attributed to poor conceptualization, in this case, the covariation between variables in the model was so limited that construction of the unobserved variables (factors) was impossible. Without these unobserved constructs the postulated structure of the model could not be empirically tested. As a result of the inability to fit the measurement model, a system of simultaneous equations was estimated.

Rather than model the relationships between imperfectly measured unobserved variables, the revised analysis strategy estimates simultaneous equations using only observed variables. Although this approach assumes perfect measurement, it does facilitate the exploration of structural relationships similar to the unobserved variable approach. The result is a nonrecursive model that estimates causal relationships between theoretically related variables.

The revised model of the caregiving network is depicted in Figure 6-1. Note that the unobserved constructs in the original model have been replaced by observed variables. Thus, income replaces economics, total hours of care replaces the primary caregiver component, number of paid helpers is a substitute for the formal network, number of unpaid helpers replaces the informal network, and care-receiver ADL's, care-receiver IADL's, caregiver stress, and caregiver burden are estimated directly.

Four endogenous variables, household income, total hours of care, number of paid helpers, and number of unpaid helpers have exogenous predictors as depicted in Figure 6-1. Medicaid and care-receiver race are predictors of household income. Caregiver gender, spousal status, living arrangement, care-receiver gender, age of the primary caregiver, the effect of caregiving on employment, the length of primary caregiving, affection, caregiver ADL's, and caregiver health perception are related to the total hours of care. The length of paid caregiving, number of paid days, number of paid ADL activities, and the number of paid IADL activities are indicators of the number of paid helpers. Finally, household size, the number of children, reciprocity, urbanness, relative's visits, relative's telephone calls, visits by friends, friends' telephone calls, number of unpaid helping days, length of unpaid caregiving, number of unpaid IADL activities, and the

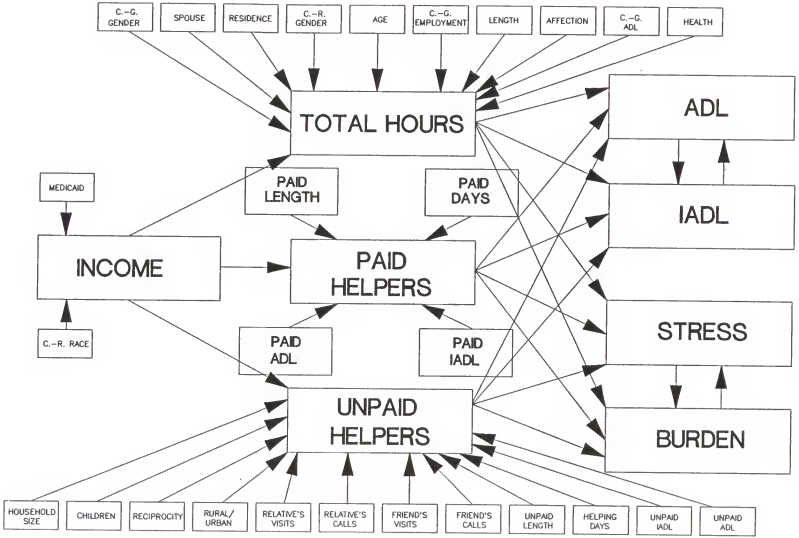

Figure 6-1: Revised Model of the Caregiving Network Estimated as a System of Simultaneous Equations

number of unpaid ADL activities are related to the number of informal helpers.

Multiple relationships between endogenous variables are expected. Figure 6-1 shows that income is expected to be related to total hours of care by the primary caregiver, number of paid helping days, and number of unpaid helping days. Moreover, the total hours of care by the primary caregiver, number of paid helpers, and number of unpaid helpers are related to the maintenance of the functionally impaired elderly (ADL and IADL limitations) and caregiver stress/burden. All variables used in the revised model of caregiving are listed in Table 6-1.

Structural Equations

The system of structural equations for the eight endogenous variables in the model are found in Table 6-2. These equations identify all predictors of the dependent variables in the model. Moreover, they are consistent with published literature on various aspects of the caregiving network and the shared functions conceptual framework that orients this research. For example, household income (y_1) is a function of the receipt of Medicaid, care-receiver race, household size, urbanness, and equation error. The remaining seven equations are interpreted in a similar fashion.

Figure 6-2 shows the structural equations for the dependent variables in the caregiving model in matrix form.

Table 6-1: List of Variables Utilized in Caregiving Analysis

y_1	=	Household Income
y_2	=	Total Hours of Care by Primary Caregiver
y_3	=	Number of Paid Helpers
y_4	=	Number of Informal Helpers
y_5	=	Number of ADL Impairments
y_6	=	Number of IADL Impairments
y_7	=	Primary Caregiver Stress
y_8	=	Primary Caregiver Burden
x_1	=	Medicaid
x_2	=	Care-receiver Race
x_3	=	Gender of Primary Caregiver
x_4	=	Spousal Status
x_5	=	Living Arrangement
x_6	=	Care-receiver Gender
x_7	=	Age of Primary Caregiver
x_8	=	Effect of Caregiving on Employment
x_9	=	Length of Primary Caregiving
x_{10}	=	Affection for Care-receiver
x_{11}	=	Primary Caregiver ADL Impairments
x_{12}	=	Primary Caregiver Health Perception
x_{13}	=	Length of Paid Caregiving
x_{14}	=	Number of Paid Helping Days
x_{15}	=	Number of Paid ADL Activities
x_{16}	=	Number of Paid IADL Activities
x_{17}	=	Household Size

Table 6-1--continued

x_{18}	=	Number of Children
x_{19}	=	Reciprocity of Care-receiver
x_{20}	=	Urbanness
x_{21}	=	Number of Visits by Relatives
x_{22}	=	Number of Telephone Calls from Relatives
x_{23}	=	Number of Visits by Friends
x_{24}	=	Number of Telephone Calls from Friends
x_{25}	=	Length of Unpaid Caregiving
x_{26}	=	Number of Informal Helping Days
x_{27}	=	Number of Unpaid IADL Activities
x_{28}	=	Number of Unpaid ADL Activities

Table 6-2: Structural Equations for Dependent Variables in Caregiving Model

EQUATION #1: $y_1 = \gamma_{11}x_1+\gamma_{12}x_2+\gamma_{1,17}x_{17}+\gamma_{1,20}x_{20}+\zeta_1$

EQUATION #2: $y_2 = \beta_{21}y_1+\gamma_{23}x_3+\gamma_{24}x_4+\gamma_{25}x_5+\gamma_{26}x_6+\gamma_{27}x_7+\gamma_{28}x_8+\gamma_{29}x_9+\gamma_{2,10}x_{10}+\gamma_{2,11}x_{11}+\gamma_{2,12}x_{12}+\gamma_{2,19}x_{19}+\zeta_2$

EQUATION #3: $y_3 = \beta_{31}y_1+\beta_{32}y_2+\gamma_{3,13}x_{13}+\gamma_{3,14}x_{14}+\gamma_{3,15}x_{15}+\gamma_{3,16}x_{16}+\zeta_3$

EQUATION #4: $y_4 = \beta_{41}y_1+\beta_{42}y_2+\beta_{43}y_3+\gamma_{49}x_9+\gamma_{4,17}x_{17}+\gamma_{4,18}x_{18}+\gamma_{4,19}x_{19}+\gamma_{4,20}x_{20}+\gamma_{4,21}x_{21}+\gamma_{4,22}x_{22}+\gamma_{4,23}x_{23}+\gamma_{4,24}x_{24}+\gamma_{4,25}x_{25}+\gamma_{4,26}x_{26}+\gamma_{4,27}x_{27}+\gamma_{4,28}x_{28}+\zeta_4$

EQUATION #5: $y_5 = \beta_{52}y_2+\beta_{53}y_3+\beta_{54}y_4+\beta_{56}y_6+\gamma_{5,28}x_{28}+\zeta_5$

EQUATION #6: $y_6 = \beta_{62}y_2+\beta_{63}y_3+\beta_{64}y_4+\beta_{65}y_5+\gamma_{6,17}x_{17}+\gamma_{6,19}x_{19}+\gamma_{6,27}x_{27}+\zeta_6$

EQUATION #7: $y_7 = \beta_{72}y_2+\beta_{73}y_3+\beta_{74}y_4+\beta_{78}y_8+\gamma_{7,10}x_{10}+\zeta_7$

EQUATION #8: $y_8 = \beta_{82}y_2+\beta_{83}y_3+\beta_{84}y_4+\beta_{86}y_6+\gamma_{83}x_3+\gamma_{85}x_5+\gamma_{88}x_8+\gamma_{8,12}x_{12}+\gamma_{8,19}x_{19}+\zeta_8$

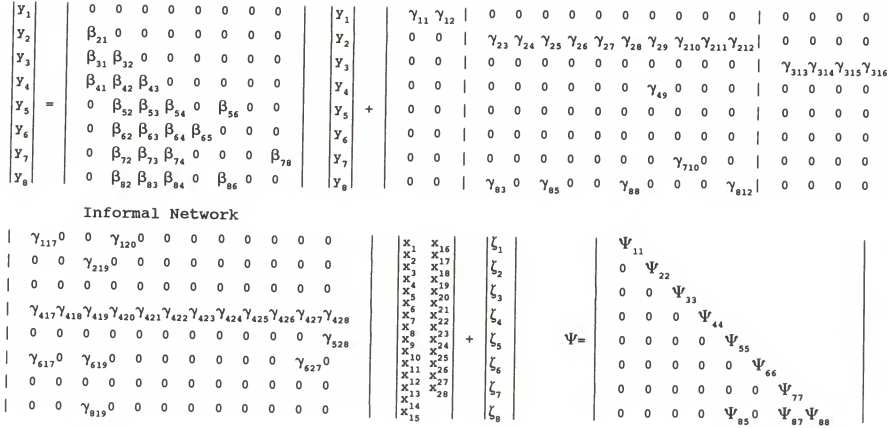

Figure 6-2: Structural Equations for Dependent Variables in Caregiving Model in Matrix Form

Note: The Phi-Matrix (Φ) is symmetric and free allowing all independent variables to intercorrelate.

The general equation is: $y = \beta y + \Gamma x + \zeta$. Reading from left to right, y_1 (household income) is a function of γ_{11}, γ_{12}, $\gamma_{1,17}$, $\gamma_{1,20}$, and ζ_1, the same variables identified in Table 6-2. The Ψ matrix in the lower right-hand corner of Figure 6-2 identifies equation error in the diagonal and those errors allowed to correlate across equations in the off-diagonals. In this case, other than the diagonal elements, only Ψ_{85}, the equation error between primary caregiver burden and care-receiver ADL impairment, and Ψ_{87}, the equation error between burden and primary caregiver stress, were allowed to correlate. It is appropriate to correlate these error terms because burden and ADL impairments and burden and stress are conceptually and empirically linked in previous research.

Model Fit and Parameter Estimates

The data in Table 6-3 provide evidence that the model of the caregiving network estimated with the specified system of simultaneous equations fits the data reasonably well. The chi-square value is 540.55 and the chi-square to degrees of freedom ratio is 2.91. The latter value is below the five to one ratio advocated by Wheaton et al. (1979) and in line with the more stringent expectations of Carmines and McIver (1981) for a good model fit. Moreover, the adjusted goodness of fit is .926 and the root mean square residual is acceptably small at .047. The total coefficient of determination for structural equations, a

Table 6-3: Parameter Estimates for Simultaneous Equations Fit to the Caregiving Network: Total Sample (Total Effects in Parentheses)

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
Income (Y_1)	--	0.008 (0.008)	0.011 (0.011)	-0.025 (-0.014)	--	--	--	--
Hours of Care (Y_2)	--	--	-0.006 (-0.006)	-0.063* (-0.069)	0.598*** (0.808)	0.553*** (0.547)	-0.196 (0.571)	1.057*** (1.176)
Paid Helpers (Y_3)	--	--	--	1.061*** (1.061)	0.564*** (0.546)	1.100*** (0.425)	0.075 (0.050)	-0.071 (0.009)
Unpaid Helpers (Y_4)	--	--	--	--	-0.165*** (-0.384)	-0.610*** (-0.591)	-0.030 (-0.119)	-0.010 (-0.138)
ADL (Y_5)	--	--	--	--	--	-0.051 (-0.050)	--	--
IADL (Y_6)	--	--	--	--	0.371*** (0.364)	--	--	0.216*** (0.212)
Stress (Y_7)	--	--	--	--	--	--	--	--
Burden (Y_8)	--	--	--	--	--	--	0.651*** (0.651)	--
Medicaid (X_1) (Receipt=1)	-0.225*** (-0.225)	--	--	--	--	--	--	--
C.-R. Race (X_2) (Black=1)	-0.184*** (-0.184)	--	--	--	--	--	--	--

Table 6-3--continued

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
C.-G. Gender (x_3) (Male=1)	--	0.064* (0.064)	--	--	--	--	--	-0.540*** (-0.465)
Spousal Status (x_4) (Spouse=1)	--	0.007 (0.007)	--	--	--	--	--	--
Living Arrangement-- (x_5) (Shared=1)		0.044 (0.044)	--	--	--	--	--	0.725*** (0.776)
C.-R. Gender (x_6) (Male=1)	--	-0.020 (-0.020)	--	--	--	--	--	--
Age (x_7)	--	0.004 (0.004)	--	--	--	--	--	--
C.-G. Employment (x_8)	--	0.047*** (0.047)	--	--	--	--	--	0.368*** (0.423)
C.-G. Length (x_9)	--	-0.027 (-0.027)	--	-0.113*** (-0.111)	--	--	--	--
Affection (x_{10})	--	0.032*** (0.032)	--	--	--	--	0.170*** (0.189)	--
C.-G. ADL (x_{11})	--	0.026 (0.026)	--	--	--	--	--	--
Health (x_{12})	--	-0.036** (-0.036)	--	--	--	--	--	-0.408*** (-0.451)
Paid Length (x_{13})	--	--	0.185*** (0.185)	--	--	--	--	--

Table 6-3--continued

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
Paid Days (x_{14})	--	--	0.063*** (0.063)	--	--	--	--	--
Paid ADL (x_{15})	--	--	0.215*** (0.215)	--	--	--	--	--
Paid IADL (x_{16})	--	--	0.067*** (0.067)	--	--	--	--	--
Household Size (x_{17})	0.111*** (0.111)	--	--	0.014 (0.012)	--	0.171*** (0.162)	--	--
Children (x_{18})	--	--	--	0.015* (0.015)	--	--	--	--
Reciprocity (x_{19})	--	-0.047*** (-0.047)	--	0.012 (0.016)	--	-0.398*** (-0.424)	--	-0.256*** (-0.398)
Urbanness (x_{20})	0.037*** (0.037)	--	--	0.026*** (0.025)	--	--	--	--
Relative's Visits (x_{21})	--	--	--	0.026** (0.026)	--	--	--	--
Relative's Calls (x_{22})	--	--	--	0.011 (0.011)	--	--	--	--
Friend's Visits (x_{23})	--	--	--	0.002 (0.002)	--	--	--	--
Friend's Calls (x_{24})	--	--	--	0.019 (0.019)	--	--	--	--
Unpaid Length (x_{25})	--	--	--	1.457*** (1.457)	--	--	--	--

Table 6-3--continued

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
Informal Days (x_{26})	--	--	--	0.202*** (0.202)	--	--	--	--
Unpaid IADL (x_{27})	--	--	--	0.349*** (0.349)	--	4.413*** (4.124)	--	--
Unpaid ADL (x_{28})	--	--	--	0.331*** (0.331)	0.417*** (0.283)	--	--	--
Squared Multiple Correlations:	.239	.048	.885	.854	.289	.378	.094	.229

Total Coefficient of Determination for Structural Equations: .992

Model Statistics: χ^2 = 540.55 (p=0.0001)
df = 186
χ^2/df = 2.91
Adjusted Goodness of Fit = .926
Root Mean Square Residual = .047

* p < .05
** p < .01
*** p < .005

general measure of reliability for the complete model, is .992.

The parameter estimates (direct effects), levels of significance, and total effects for the complete model are shown in Table 6-3. The total indirect effects are reported in Appendix B. The general formulas for the decomposition of direct, indirect and total effects on y are:

Direct Effect:	Γ	β
Indirect Effect:	$(I - \beta)^{-1} \Gamma - \Gamma$	$(I - \beta)^{-1} - I - \beta$
Total Effect:	$(I - \beta)^{-1} \Gamma$	$(I - \beta)^{-1} - I$

From Table 6-3, the total indirect effects are calculated by subtracting the direct effects from the total effects. The analysis will proceed by describing the significant variables resulting from the simultaneous estimation of the equations discussed above. Total and/or indirect effects will be addressed only when they vary substantively from the direct effects.

The first endogenous variable is household income. Consistent with previous findings and theoretical expectations, blacks have significantly lower incomes than whites. Receipt of Medicaid by the functionally limited elderly care-receiver is also associated with decreased household income. The empirical analysis revealed that household size and urbanness are positively related to household income. Impaired elderly persons who live with children, some with children of their own, generally live

in larger households. Moreover, adult-child caregivers are the most likely to be employed, thereby increasing household income. Lower incomes among rural elderly persons is a common finding in aging research. These variables explain 23.9 percent of the variance in household income.

The results of the second equation, total hours of care by the primary caregiver, are not entirely consistent with previous research. For example, when the primary caregiver is male, the reported total hours spent providing caregiving services is greater. This is surprising because when men provide primary care to an impaired spouse, they are more likely to receive outside assistance. In view of the fact that these are self-reported data, this finding should be carefully considered. It may be that males and females simply have different definitions of tasks which constitute caregiving. In addition, there is a negative relationship between the primary caregiver's self-perception of health and total hours of care. Although the opposite was expected, this finding may reflect the better health of nonspouse primary caregivers who have more demands on their time. The nonsignificant relationship between household income and total hours of care supports the notion that physical and emotional resources, rather than financial considerations, influence the amount of time spent by a primary caregiver providing services to an impaired elderly person.

On the other hand, two relationships are consistent with theoretical expectations. The effect of caregiving on primary caregiver employment is positively associated with total hours of care. Primary caregivers who are employed generally utilize formal and informal assistance until the multiple needs of the care-receiver are such that more frequent, continuous care is necessary. This finding supports the assertion of Horowitz (1985) that the impact of caregiving on labor force participation is substantial. Primary caregiver affection for the care-receiver is also positively related to total hours of care. Finally, the greater the number of reciprocal tasks the care-receiver performs for the primary caregiver, the less the total hours of care. One plausible explanation for this result is that care-receivers who are capable of providing reciprocal services are likely to have greater functioning and thereby require less assistance. Although many of these relationships are conceptually important to the overall model of the caregiving network, these variables explain only 4.8 percent of the variance in total hours of care by the primary caregiver.

The third endogenous variable is the number of paid helpers. Contrary to expectations, household income is not significantly related to the number of paid helpers. A positive relationship was expected under the assumption that higher household incomes facilitate the hiring of paid assistance. Moreover, there is no link between the total

hours of care by the primary caregiver and the number of paid helpers, suggesting that components of the caregiving network do not substitute for each other in meeting the needs of the functionally impaired elderly. Nevertheless, four independent predictors are positively associated with the number of paid helpers. As expected, the number of paid helpers is greater when the length of paid caregiving is longer and the number of paid days is greater. Furthermore, when the number of ADL and IADL activities increase, the number of paid helpers increases. Together, these indicators account for 88.5 percent of the variance in the number of paid helpers.

The number of unpaid helpers is the fourth endogenous variable. As with total hours of care and the number of paid helpers, the hypothesized relationship between household income and the number of unpaid helpers is not significant. However, there is a negative relationship between total hours of care and the number of unpaid helpers. Commensurate with previous research, this finding suggests that informal assistance is employed when the primary caregiver is unable or incapable of providing the time necessary to perform all the tasks necessary to avoid institutionalization of the impaired elderly person. Furthermore, contrary to the findings of Soldo (1985), there is a positive relationship between the number of paid helpers and the number of unpaid helpers. Rather than substituting for one another, it appears that the formal

and informal networks work together to meet the needs of the functionally limited elderly.

Several independent predictors of the number of unpaid helpers are significant. First, the empirical analysis revealed that the greater the number of years the primary caregiver has cared for the care-receiver, the fewer the number of unpaid helpers. It may be that over time patterns of care have developed which exclude informal assistance. On the other hand, the more protracted the period during which caregiving services are needed, the less likely that unpaid helpers will be available due to age. As expected, number of children, place of residence, and number of relative's visits are positively associated with the number of unpaid helpers. Each of these indicators taps the potential size of and access to the informal support network. Finally, the length of unpaid caregiving, number of informal days of caregiving, number of unpaid ADL activities, and the number of unpaid IADL activities are positively related to the number of paid helpers as expected. These variables account for 85.4 percent of the variance in the number of unpaid helpers.

The results of the ADL impairment equation are, with one exception, consistent with theoretical expectations. The total hours of care by the primary caregiver and number of paid helpers are positively associated with ADL impairments. There is an additional indirect effect of total hours of care on the number of ADL impairments

mediated by the number of IADL impairments. These findings suggest that greater assistance by the primary caregiver and the formal network helps to maintain a functionally impaired elderly person, who might otherwise require institutionalization, in the community.

Conversely, the negative direct association between the number of unpaid helpers and ADL impairments, and an even stronger negative indirect effect mediated by the number of IADL impairments, is surprising. One possible explanation may be that while the informal support network provides over 50 percent of services received by the elderly at all levels of functioning (Soldo and Myllyluoma, 1983), they do so in greater numbers when the functional limitations are fewer and require less training, time, and consistency. One exception to this interpretation, however, is the additional finding that when the number of ADL tasks fulfilled by unpaid helpers increases, the number of ADL impairments of the care-receiver also increases. There is a negative indirect effect of the number of unpaid ADL activities on the number of care-receiver ADL impairments mediated by the number of unpaid helpers. This further supports the notion that, although unpaid helpers may perform numerous ADL activities, these helpers are likely to be few in number. Finally, consistent with the conceptual and empirical correlation between these measures found in previous research, the greater the IADL impairments, the greater the ADL impairments. These

variables explain 28.9 percent of the variance in the number of ADL impairments.

The sixth endogenous variable is the number of care-receiver IADL impairments. Again, support for the hypothesized relationships is mixed. Total hours of care by the primary caregiver and the number of paid helpers are positively related to the number of IADL impairments, while the number of unpaid helpers is negatively associated. Moreover, there is a strong negative indirect effect between the number of paid helpers and IADL impairments mediated by the number of unpaid helpers. It appears, as with the number of ADL impairments, that the primary caregiver and the formal network are the primary mechanisms through which institutionalization is avoided, while the number of unpaid helpers declines as the needs of the increasingly functionally impaired grow.

Three additional findings are of interest. First, household size is positively related to the number of IADL impairments. IADL impairments are more common than ADL impairments and, although generally more complex, elderly persons with IADL impairments tend to require intermittent assistance. Simply having more potential helpers in close proximity means that greater numbers of IADL tasks are likely to be accomplished. Second, the greater the number of reciprocal functions the care-receiver is able to perform for the primary caregiver, the fewer are the IADL impairments. As before, the ability to reciprocate

implicitly acknowledges a level of functioning that suggests the ability to perform most or all of the necessary IADL functions. Finally, although the number of unpaid helpers is negatively associated with the number of IADL impairments, the number of unpaid IADL tasks fulfilled by unpaid helpers is positively related to IADL impairments. Again it appears that when functionally impaired elderly persons avoid institutionalization, they do so in part because fewer unpaid helpers are performing numerous IADL tasks. These variables explain 37.8 percent of the variance in the number of IADL impairments. Moreover, there is a small negative indirect effect of the number of unpaid IADL activities on the number of IADL impairments mediated by the number of unpaid helpers.

Self-perceived stress of the primary caregiver is the seventh endogenous variable. Previous research suggests that primary caregivers who provide more hours of care experience greater stress and that stress is lower when assistance is available from paid or unpaid sources. The hypothesized relationships between total hours of care, number of paid helpers, number of unpaid helpers, and primary caregiver stress are not supported in this analysis. However, there is a positive indirect effect of total hours of care on primary caregiver stress mediated by primary caregiver burden. Thus, as total hours of care increase, the sense of burden experienced by the primary caregiver grows and, in turn, stress increases. There is

also a positive direct effect between the primary caregiver's sense of burden and self-perceived stress. In addition, the greater the affection felt for the care-receiver by the primary caregiver, the greater the self-perceived stress. These variables account for 8.4 percent of the variance in self-perceived primary caregiver stress.

The consistency of results of the eighth equation, primary caregiver burden, with theoretical expectations is mixed. As expected, total hours of care is positively linked to primary caregiver burden and there is a small positive indirect effect mediated by care-receiver IADL impairments. However, the hypothesized connections between number of paid helpers, number of unpaid helpers, and primary caregiver burden are not supported. On the other hand, there is a negative indirect effect of the number of unpaid helpers on primary caregiver burden mediated by the number of IADL impairments. Moreover, the number of care-receiver IADL impairments is positively related to primary caregiver burden. These findings suggest that unpaid helpers can alleviate primary caregiver burden by performing IADL tasks for the impaired care-receiver normally accomplished by the primary caregiver.

Five exogenous variables are significantly related to primary caregiver burden. When the primary caregiver is a male, primary caregiver burden is less. This is explained by the greater likelihood that male caregivers will receive outside assistance. Moreover, primary caregiver burden is

greater when the care-receiver and primary caregiver share a residence. The effect of caregiving on primary caregiver employment is positively related to primary caregiver burden. When a primary caregiver quits, or fails to accept employment as a result of caregiving, the needs of the care-receiver are already so great that they exceed the capabilities of available formal and informal sources of support. Thus, when employment is affected by caregiving, the needs of the care-receiver preclude primary caregivers from participating in certain activities, thereby increasing their sense of burden. Conversely, the primary caregiver's self-perception of health is negatively related to burden. Finally, the greater the reciprocity by the care-receiver, the less the sense of burden felt by the primary caregiver. There is an additional negative indirect effect of reciprocity on primary caregiver burden mediated by total hours of care and care-receiver IADL impairments. These variables explain 22.9 percent of the variance in primary caregiver burden.

The significant relationships between endogenous variables described above are depicted in Figure 6-3. The nature of each relationship is denoted by a plus or minus sign in parentheses above each line.

Discussion

The results of this analysis address a number of important caregiving issues. Based on Litwak's general

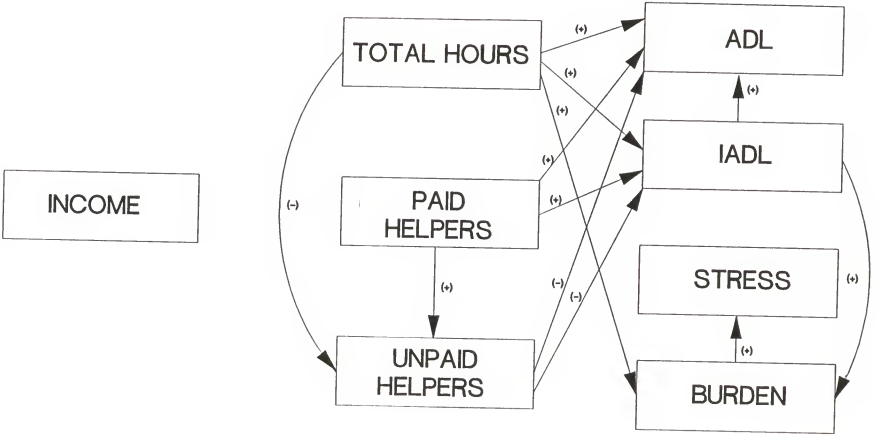

Figure 6-3: Significant Relationships Between Endogenous Variables: Total Sample

Note: Equations and results for these relationships are found in Tables 6-2 and 6-3.

sociological principle that groups can optimally manage those tasks which match them in structure, the theoretical model (see Figure 6-1) posited causal relationships between total hours of care, the number of paid helpers, the number of unpaid helpers, and each of the four antecedents to institutionalization. Results show that both total hours of care and the number of paid helpers are positively associated with the number of ADL and IADL impairments as expected. In other words, when the primary caregiver provides more care and the formal network is more actively involved in providing caregiving services, functionally impaired elderly persons can be maintained in the community at increased levels of impairment.

Surprisingly, the number of unpaid helpers is negatively related to both measures of functional impairment. Previous research has found that unpaid assistance from family, friends, and neighbors is an important component of long-term care for the functionally limited elderly (Branch and Jette, 1983) and that without this support many elderly would be forced into institutions (Cantor, 1983). The present findings suggest that as the number of ADL and IADL impairments increase, fewer unpaid helpers provide a broader range of services. Additional evidence to support this conclusion is that when unpaid helpers specifically provide ADL or IADL related assistance, the number of functional limitations among the noninstitutionalized elderly are greater. Thus, while

numerous informal helpers are capable of providing nonpersonal support typically required by impaired elderly persons with few functional limitations, care-receivers with increased impairments require specific task-fulfillment assistance on a continuous basis.

Contrary to theoretical expectations, household income is not related to either of the three components of the caregiving network. Previous research had found that income was negatively associated with formal service contact, but positively related to hours of in-home use (Bass and Noelker, 1987). Moreover, Kart and Beckham (1976) found low incomes to be a serious obstacle to institutionalization, therefore placing more emphasis on family members. The present findings may indicate that the physical and emotional resources of the caregiving network are more important than financial considerations in a population of elderly persons who are already impaired.

Included in Litwak's (1985) "theory of shared functions" is the concept of functional substitutability. Although these relationships are not depicted in the theoretical model, if functional substitutability was at work in the caregiving network negative relationships between each of the caregiving components would be found. Interestingly, total hours of care is negatively associated with the number of unpaid helpers, but the number of paid helpers is positively related to the number of unpaid helpers. Thus, while unpaid helpers provide assistance as

a direct result of the inability of the primary caregiver to meet all of the care-receiver's needs, the conclusion of McCauley and Blieszner (1985) that a combination of formal and informal care is preferential appears to be accurate.

Self-perceived stress and the subjective sense of burden of the primary caregiver have been linked to the institutionalization of functionally impaired elderly persons in the caregiving literature. It was expected that total hours of care would be positively associated with caregiver stress and burden and that the number of paid and unpaid helpers would be negatively associated. However, only total hours of care is significantly associated with primary caregiver burden. Moreover, the number of IADL impairments is positively related to burden, consistent with the research of Perlman and Giele (1982), and caregiver burden is positively related to self-perceived primary caregiver stress.

These findings suggest that the effect of caregiving components on caregiver stress and the importance of stress as an antecedent to institutionalization may be overstated in previous research. However, the use of a single item self-report measure of stress, typical in the sociological literature, may be problematic. When these relationships are examined in a sample of functionally impaired elderly persons, caregiver burden is the most important factor. This supports the assertion of Quadagno et al. (1987), among others, that formal services do little to alleviate

the subjective feelings of burden felt by primary caregivers. Thus, while caregiver stress is not good and should be avoided if possible, it appears to be an unimportant variable in understanding and analyzing the caregiving network and other antecedents to institutionalization.

Summary

The hypothesis directly addressed by this chapter is that the model of the caregiving network proposed in chapter three would adequately fit the data. An unobserved variable model was not testable because of the lack of covariance between multiple indicators of the unobserved variables. Thus, a system of simultaneous equations assuming perfectly measured variables was estimated. The model was determined to be an adequate representation of the data.

The theoretical model employed in this research posited that total hours of care, the number of paid helpers, and the number of unpaid helpers would jointly influence ADL impairments, IADL impairments, self-perceived primary caregiver stress, and subjective primary caregiver burden. While these relationships were only partially supported, several additions to the caregiving literature have been made. Most importantly, the effects of household income, unpaid helpers, and caregiver stress on the caregiving network found in previous research have been challenged.

These findings will be useful in designing future research, formulating policies, and implementing intervention strategies that affect the growing population of functionally limited elderly persons.

CHAPTER SEVEN
AGE-LINKED DISSIMILARITIES IN THE CAREGIVING NETWORK

In chapter five it was established that there are significant differences in caregiving related variables by age of the care-receiver. In chapter six, a model of the caregiving network was found to fit the pooled data adequately. This chapter explores whether there are differences in the caregiving network by age of the care-receiver. Specifically, it addresses the hypothesis that the variance-covariance matrices for samples representing elderly persons 65 to 74, 75 to 84, and 85 and older will be different. If this hypothesis is supported, the implication is that the model of the caregiving network utilized in the previous chapter should be fit to each subsample of elderly persons independently (without pooling the data). The purpose is to establish empirically whether or not there are differences in the caregiving network by age of the care-receiver that should be taken into account when conducting research and developing policies that affect the functionally limited elderly population.

A test of the equality of covariance matrices can be carried out by specifying $\Psi^{(1)} = \Psi^{(2)} = \Psi^{(3)}$, where $\Lambda_y = I$ and $\Theta_\epsilon = 0$, using LISREL. These assumptions mean that $y = \eta$ and that $\Sigma^{(g)} = \Psi^{(g)}$ for $g = 1, 2, 3$. The hypothesis

$\Sigma^{(1)} = \Sigma^{(2)} = \Sigma^{(3)}$ is therefore the same as $\Psi^{(1)} = \Psi^{(2)} = \Psi^{(3)}$. Rejecting this hypothesis means that the covariance matrices are different and that it is inappropriate to fit the model of the caregiving network to the entire pooled sample.

The test of the equality of covariance matrices hypothesis with three age stratified subsamples of elderly persons produced a chi-square value of 2302.53 with 1332 degrees of freedom, significant at the $p<.0001$ level. As a result, the equality hypothesis can be rejected and the hypothesis that the variance-covariance matrices are different is supported. Thus, fitting the model of the caregiving network to age stratified subsamples of elderly persons is warranted.

The analysis will proceed by presenting the data for all three age cohorts simultaneously. Throughout the text of this chapter, the analysis will focus on differences in the three age stratified subsamples.

Model Fit and Parameter Estimates for Three Age Cohorts

The structural equations for the dependent variables in the model of the caregiving network analyzed in this chapter are the same as those found in Table 6-2 and depicted in matrix form in Figure 6-2. Tables 7-1, 7-2, and 7-3 show the parameter estimates and total effects for simultaneous equations fit to the caregiving network for the 65 to 74, 75 to 84, and 85 and older age cohorts

Table 7-1: Parameter Estimates for Simultaneous Equations Fit to the Caregiving Network: 65 to 74 Age Cohort (Total Effects in Parentheses)

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
Income (y_1)	--	0.011 (0.011)	0.051* (0.051)	-0.038 (-0.038)	--	--	--	--
Hours of Care (y_2)	--	--	-0.008 (-0.008)	-0.069 (-0.078)	0.397*** (0.667)	0.642*** (0.692)	-0.056 (0.770)	.971*** (1.102)
Paid Helpers (y_3)	--	--	--	1.115*** (1.115)	0.613*** (0.560)	1.308*** (0.544)	0.325* (0.133)	-0.077 (-0.012)
Unpaid Helpers (y_4)	--	--	--	--	-0.228*** (-0.485)	-0.689*** (-0.693)	-0.165** (-0.284)	-0.033 (-0.162)
ADL (y_5)	--	--	--	--	--	0.009 (0.009)	--	--
IADL (y_6)	--	--	--	--	0.371*** (0.372)	--	--	0.186*** (0.186)
Stress (y_7)	--	--	--	--	--	--	--	--
Burden (y_8)	--	--	--	--	--	--	0.739*** (0.739)	--
Medicaid (x_1) (Receipt=1)	-0.237*** (-0.237)	--	--	--	--	--	--	--
C.-R. Race (x_2) (Black=1)	-0.157*** (-0.157)	--	--	--	--	--	--	--

Table 7-1--continued

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
C.-G. Gender (x_3) (Male=1)	--	0.041 (0.041)	--	--	--	--	--	-0.362* (-0.316)
Spousal Status (x_4) (Spouse=1)	--	0.005 (0.005)	--	--	--	--	--	--
Living Arrangement-- (x_5) (Shared=1)		0.064 (0.064)	--	--	--	--	--	0.545* (0.615)
C.-R. Gender (x_6) (Male=1)	--	-0.052 (-0.052)	--	--	--	--	--	--
Age (x_7)	--	-0.000 (-0.000)	--	--	--	--	--	--
C.-G. Employment (x_8)	--	0.006 (0.006)	--	--	--	--	--	0.515*** (0.521)
C.-G. Length (x_9)	--	-0.041 (-0.041)	--	-0.080** (-0.077)	--	--	--	--
Affection (x_{10})	--	0.019* (0.019)	--	--	--	--	0.208*** (0.222)	--
C.-G. ADL (x_{11})	--	0.033 (0.033)	--	--	--	--	--	--
Health (x_{12})	--	-0.016 (-0.016)	--	--	--	--	--	-0.422*** (-0.440)
Paid Length (x_{13})	--	--	0.181*** (0.181)	--	--	--	--	--

Table 7-1--continued

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
Paid Days (x_{14})	--	--	0.071*** (0.071)	--	--	--	--	--
Paid ADL (x_{15})	--	--	0.252*** (0.252)	--	--	--	--	--
Paid IADL (x_{16})	--	--	0.060*** (0.060)	--	--	--	--	--
Household Size (x_{17})	0.071*** (0.071)	--	--	-0.009 (-0.008)	--	0.029 (0.040)	--	--
Children (x_{18})	--	--	--	0.013 (0.013)	--	--	--	--
Reciprocity (x_{19})	--	-0.038* (-0.038)	--	0.017 (0.020)	--	-0.340*** (-0.379)	--	-0.243*** (-0.351)
Urbanness (x_{20})	0.041*** (0.041)	--	--	0.024 (0.025)	--	--	--	--
Relative's Visits (x_{21})	--	--	--	0.021 (0.021)	--	--	--	--
Relative's Calls (x_{22})	--	--	--	0.001 (0.001)	--	--	--	--
Friend's Visits (x_{23})	--	--	--	0.010 (0.010)	--	--	--	--
Friend's Calls (x_{24})	--	--	--	0.031 (0.031)	--	--	--	--
Unpaid Length (x_{25})	--	--	--	1.422*** (1.422)	--	--	--	--

Table 7-1--continued

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
Informal Days (x_{26})	--	--	--	0.103 (0.103)	--	--	--	--
Unpaid IADL (x_{27})	--	--	--	0.376*** (0.376)	--	5.506*** (5.263)	--	--
Unpaid ADL (x_{28})	--	--	--	0.443*** (0.443)	0.467*** (0.254)	--	--	--
Squared Multiple Correlations:	.179	.028	.865	.861	.317	.482	.091	.217

Total Coefficient of Determination for Structural Equations: .992

Model Statistics: χ^2 = 379.65 (p=0.0001)
df = 186
χ^2/df = 2.04
Adjusted Goodness of Fit = .880
Root Mean Square Residual = .058

* p < .05
** p < .01
*** p < .005

Table 7-2: Parameter Estimates for Simultaneous Equations Fit to the Caregiving Network: 75 to 84 Age Cohort (Total Effects in Parentheses)

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
Income (y_1)	--	0.003 (0.003)	-0.025 (-0.025)	0.024 (-0.001)	--	--	--	--
Hours of Care (y_2)	--	--	0.005 (0.005)	-0.064 (-0.059)	0.718*** (0.853)	0.352* (0.358)	-0.498* (0.375)	1.304*** (1.378)
Paid Helpers (y_3)	--	--	--	1.009*** (1.009)	0.500*** (0.463)	0.893*** (0.276)	-0.162 (0.093)	0.184 (0.201)
Unpaid Helpers (y_4)	--	--	--	--	-0.133 (-0.336)	-0.593*** (-0.580)	0.126* (0.029)	-0.038 (-0.152)
ADL (y_5)	--	--	--	--	--	-0.039 (-0.039)	--	--
IADL (y_6)	--	--	--	--	0.351*** (0.346)	--	--	0.198*** (0.195)
Stress (y_7)	--	--	--	--	--	--	--	--
Burden (y_8)	--	--	--	--	--	--	0.639*** (0.639)	--
Medicaid (x_1) (Receipt=1)	-0.230*** (-0.230)	--	--	--	--	--	--	--
C.-R. Race (x_2) (Black=1)	-0.204*** (-0.204)	--	--	--	--	--	--	--

Table 7-2--continued

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
C.-G. Gender (x_3) (Male=1)	--	0.137** (0.137)	--	--	--	--	--	-0.796*** (-0.606)
Spousal Status (x_4) (Spouse=1)	--	0.127* (0.127)	--	--	--	--	--	--
Living Arrangement-- (x_5) (Shared=1)		-0.005 (-0.005)	--	--	--	--	--	0.854*** (0.848)
C.-R. Gender (x_6) (Male=1)	--	0.015 (0.015)	--	--	--	--	--	--
Age (x_7)	--	-0.018 (-0.018)	--	--	--	--	--	--
C.-G. Employment (x_8)	--	0.097*** (0.097)	--	--	--	--	--	0.331*** (0.465)
C.-G. Length (x_9)	--	0.022 (0.022)	--	-0.122** (-0.124)	--	--	--	--
Affection (x_{10})	--	0.037*** (0.037)	--	--	--	--	0.094*** (0.108)	--
C.-G. ADL (x_{11})	--	-0.001 (-0.001)	--	--	--	--	--	--
Health (x_{12})	--	-0.041 (-0.041)	--	--	--	--	--	-0.345*** (-0.402)
Paid Length (x_{13})	--	--	0.187*** (0.187)	--	--	--	--	--

Table 7-2--continued

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
Paid Days (x_{14})	--	--	0.044*** (0.044)	--	--	--	--	--
Paid ADL (x_{15})	--	--	0.174*** (0.174)	--	--	--	--	--
Paid IADL (x_{16})	--	--	0.122*** (0.122)	--	--	--	--	--
Household Size (x_{17})	0.139*** (0.139)	--	--	0.010 (0.010)	--	0.200*** (0.188)	--	--
Children (x_{18})	--	--	--	0.013 (0.013)	--	--	--	--
Reciprocity (x_{19})	--	-0.039* (-0.039)	--	0.007 (0.009)	--	-0.347*** (-0.361)	--	-0.264*** (-0.387)
Urbanness (x_{20})	0.035*** (0.035)	--	--	0.030* (0.030)	--	--	--	--
Relative's Visits (x_{21})	--	--	--	0.050*** (0.050)	--	--	--	--
Relative's Calls (x_{22})	--	--	--	0.006 (0.006)	--	--	--	--
Friend's Visits (x_{23})	--	--	--	0.004 (0.004)	--	--	--	--
Friend's Calls (x_{24})	--	--	--	-0.001 (-0.001)	--	--	--	--
Unpaid Length (x_{25})	--	--	--	1.478*** (1.478)	--	--	--	--

Table 7-2--continued

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
Informal Days (x_{26})	--	--	--	0.291*** (0.291)	--	--	--	--
Unpaid IADL (x_{27})	--	--	--	0.283*** (0.283)	--	4.411*** (4.187)	--	--
Unpaid ADL (x_{28})	--	--	--	0.284*** (0.284)	0.415*** (0.314)	--	--	--
Squared Multiple Correlations:	.296	.090	.911	.856	.274	.374	.057	.253

Total Coefficient of Determination for Structural Equations: .994

Model Statistics: χ^2 = 283.43 (p=0.0001)
df = 186
χ^2/df = 1.52
Adjusted Goodness of Fit = .895
Root Mean Square Residual = .052

* p < .05
** p < .01
*** p < .005

Table 7-3: Parameter Estimates for Simultaneous Equations Fit to the Caregiving Network: 85 and Older Age Cohort (Total Effects in Parentheses)

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
Income (Y_1)	--	0.051 (0.051)	0.003 (0.003)	-0.091 (-0.091)	--	--	--	--
Hours of Care (Y_2)	--	--	-0.009 (-0.009)	-0.041 (-0.051)	0.741*** (0.992)	0.694** (0.589)	0.043 (0.607)	0.893*** (1.042)
Paid Helpers (Y_3)	--	--	--	1.047*** (1.047)	0.614*** (0.640)	0.811*** (0.265)	0.057 (-0.170)	-0.517* (-0.453)
Unpaid Helpers (Y_4)	--	--	--	--	-0.083 (-0.261)	-0.448*** (-0.416)	0.019 (-0.037)	-0.001 (-0.103)
ADL (Y_5)	--	--	--	--	--	-0.121 (-0.115)	--	--
IADL (Y_6)	--	--	--	--	0.428*** (0.407)	--	--	0.245*** (0.233)
Stress (Y_7)	--	--	--	--	--	--	--	--
Burden (Y_8)	--	--	--	--	--	--	0.543*** (0.543)	--
Medicaid (x_1) (Receipt=1)	-0.215*** (-0.215)	--	--	--	--	--	--	--
C.-R. Race (x_2) (Black=1)	-0.228*** (-0.228)	--	--	--	--	--	--	--

Table 7-3--continued

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
C.-G. Gender (x_3) (Male=1)	--	-0.017 (-0.017)	--	--	--	--	--	-0.253 (-0.270)
Spousal Status (x_4) (Spouse=1)	--	-0.016 (-0.016)	--	--	--	--	--	--
Living Arrangement-- (x_5) (Shared=1)		0.048 (0.048)	--	--	--	--	--	0.804*** (0.854)
C.-R. Gender (x_6) (Male=1)	--	-0.037 (-0.037)	--	--	--	--	--	--
Age (x_7)	--	0.019 (0.019)	--	--	--	--	--	--
C.-G. Employment (x_8)	--	0.059* (0.059)	--	--	--	--	--	0.159 (0.220)
C.-G. Length (x_9)	--	-0.050 (-0.050)	--	-0.172*** (-0.169)	--	--	--	--
Affection (x_{10})	--	0.043*** (0.043)	--	--	--	--	0.244*** (0.270)	--
C.-G. ADL (x_{11})	--	0.054 (0.054)	--	--	--	--	--	--
Health (x_{12})	--	-0.070* (-0.070)	--	--	--	--	--	-0.579*** (-0.652)
Paid Length (x_{13})	--	--	0.205*** (0.205)	--	--	--	--	--

Table 7-3--continued

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
Paid Days (x_{14})	--	--	0.073*** (0.073)	--	--	--	--	--
Paid ADL (x_{15})	--	--	0.186*** (0.186)	--	--	--	--	--
Paid IADL (x_{16})	--	--	-0.018 (-0.018)	--	--	--	--	--
Household Size (x_{17})	0.124*** (0.124)	--	--	0.051* (0.040)	--	0.212* (0.189)	--	--
Children (x_{18})	--	--	--	0.014 (0.014)	--	--	--	--
Reciprocity (x_{19})	--	-0.075*** (-0.075)	--	0.008 (0.012)	--	-0.412*** (-0.439)	--	-0.214* (-0.389)
Urbanness (x_{20})	0.026* (0.026)	--	--	0.012 (0.010)	--	--	--	--
Relative's Visits (x_{21})	--	--	--	0.004 (0.004)	--	--	--	--
Relative's Calls (x_{22})	--	--	--	0.016 (0.016)	--	--	--	--
Friend's Visits (x_{23})	--	--	--	-0.012 (-0.012)	--	--	--	--
Friend's Calls (x_{24})	--	--	--	0.030 (0.030)	--	--	--	--
Unpaid Length (x_{25})	--	--	--	1.507*** (1.507)	--	--	--	--

Table 7-3--continued

VARIABLE	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
Informal Days (x_{26})	--	--	--	0.217** (0.217)	--	--	--	--
Unpaid IADL (x_{27})	--	--	--	0.391*** (0.391)	--	2.454*** (2.170)	--	--
Unpaid ADL (x_{28})	--	--	--	0.236*** (0.236)	0.353* (0.274)	--	--	--
Squared Multiple Correlations:	.276	.098	.901	.855	.253	.169	.165	.224

Total Coefficient of Determination for Structural Equations: .992

Model Statistics: χ^2 = 293.09 (p=0.0001)
df = 186
χ^2/df = 1.58
Adjusted Goodness of Fit = .828
Root Mean Square Residual = .059

* p < .05
** p < .01
*** p < .005

respectively. Measures of model fit reveal that, for each of the age stratified subsamples, the model of the caregiving network fits reasonably well. However, the model fit for the 75 to 84 age cohort is slightly better than for the other two subsamples.

Data for the 65 to 74 age cohort are found in Table 7-1. The chi-square value is 379.65 with 186 degrees of freedom and the chi-square to degrees of freedom ratio is 2.04. The adjusted goodness of fit is .880 and the root mean square residual is .058. The total coefficient of determination for structural equations is .992. As before, the direct effects, total effects, and levels of significance are shown in Table 7-1. The indirect effects are listed in Appendix C.

Data for the 75 to 84 age cohort are found in Table 7-2. The chi-square value is 283.43 with 186 degrees of freedom and the chi-square to degrees of freedom ratio is 1.52. The adjusted goodness of fit is .895 and the root mean square residual is .052. The total coefficient of determination for structural equations is .994. The indirect effects for this model are listed in Appendix D.

Data for the 85 and older age cohort are found in Table 7-3. The chi-square value is 293.09 with 186 degrees of freedom and the chi-square to degrees of freedom ratio is 1.58. The adjusted goodness of fit is .828 and the root mean square residual is .059. The total coefficient of

determination for structural equations is .992. The indirect effects for this model are listed in Appendix E.

The first endogenous variable is household income. Across samples, blacks and those who receive Medicaid have lower incomes. Moreover, household size and urbanness are positively related to household income. The only difference is that for those 85 and older, the positive effect of urbanness is significant only at the $p<.05$ level, rather than the $p<.005$ level found in the other two age cohorts. These variables explain 17.9 percent of the variance in household income for those 65 to 74, 29.6 percent for those 75 to 84, and 27.6 percent for those 85 and older.

Results of the second equation, total hours of care by the primary caregiver, vary substantially across age stratified subsamples. The unexpected finding that when the primary caregiver is male total hours of care increases, is significant only for the 75 to 84 age cohort (see Table 7-2). In addition, although spousal status was not significant when analyzing the total sample, spouses provide greater total hours of care when the care-receiver is 75 to 84. There is an important interaction between these variables. One possibility is that spouses who are primary caregivers spend more hours providing caregiving services in this age cohort because of the increased impairment of the care-receiver and their own functional

limitations. This explanation may be especially applicable when the primary caregiver is a male spouse.

As expected, the effect of caregiving on employment is positively related to total hours of care only when the care receiver is 75 to 84 or 85 and older. It is in these age cohorts that the primary caregiver is more likely to be an adult-child. Affection is also positively related to total hours of care across age subsamples. Interestingly, self-perception of health by the primary caregiver is negatively related to total hours of care only for the 85 and older age cohort. One explanation is that the increased age of primary caregivers in this age cohort, whether a spouse or an adult-child, increases the likelihood of health problems and subsequently decreases their physical capacity to provide caregiving services over an extended period of time. Finally, reciprocity is negatively related to total hours of care across age cohorts. The variance explained in total hours of care by these variables increases from 2.8 percent for the 65 to 74 age cohort, to 9.0 percent and 9.8 percent for the 75 to 84 and 85 and older age cohorts respectively.

The third endogenous variable is the number of unpaid helpers. Although it was expected that household income would be positively related to the number of unpaid helpers for all age cohorts, the relationship is significant at the $p<.05$ level only when the care-receiver is 65 to 74. This finding probably reflects the need for care-receivers to

"spend down" their assets and income by paying for care themselves before qualifying for Medicaid benefits. On the other hand, since a spouse is more likely to be the primary caregiver in this subsample, it may be preferable to pay for assistance rather than deal with the increased stress of coordinating the activities of unpaid helpers (Soldo and Myllyluoma, 1983). With one exception, length of paid caregiving, number of paid days, number of paid ADL activities, and number of paid IADL activities are positively associated with the number of paid helpers. When the care-receiver is 85 and older, the number of paid IADL activities is no longer significant. For this age cohort, financial resources are probably used for more assistance with increasing ADL limitations. The variance explained in the number of paid helpers by these variables is 86.5 percent for those 65 to 74, 91.1 percent for those 75 to 84, and 90.1 percent for those 85 and older.

Results of the fourth equation, number of unpaid helpers, show that while some relationships are consistent, others vary substantially across age stratified subsamples. For example, the positive associations between number of paid helpers, length of unpaid caregiving, number of IADL activities, number of ADL activities, and the number of unpaid helpers are present in all age cohorts. Also, length of caregiving by the primary caregiver is negatively related to number of unpaid helpers in all three subsamples. On the other hand, although total hours of

care was negatively related to the number of unpaid helpers and the number of children was positively linked to the number of unpaid helpers when analyzing the total sample, these relationships are not significant in any of the age stratified subsamples. This outcome suggests that significance when analyzing the pooled data is a result of the larger sample size.

Interestingly, household size is positively related to the number of unpaid helpers at the $p<.05$ level only when the care-receiver is 85 and older. Moreover, urbanness and the number of relative's visits are positively associated with the number of paid helpers only for the 75 to 84 age cohort. These findings suggest that it may be this age cohort that faces some of the most difficult decisions regarding their living environment. Relative's visits are probably greater because the number of impairments experienced by those 75 to 84 is increasing, while household size is greatest for the oldest old because by that time movement into the household of an adult-child has already taken place. This age cohort also may have the greatest need for unpaid helpers which are more readily available in urban settings. Finally, contrary to expectations and findings for the other age cohorts, the number of informal helping days is not significantly related to number of unpaid helpers when the care-receiver is 65 to 74. This discovery probably reflects the generally lower number of functional impairments

experienced by the care-receiver in this age cohort. The variance in the number of unpaid helpers explained by these variables is nearly the same across subsamples. The equation explains 86.1 percent, 85.6 percent, and 85.5 percent of the variance for those 65 to 74, 75 to 84, and 85 and older respectively.

The fifth endogenous variable is the number of ADL impairments experienced by the care-receiver. With one exception, the relationships found when analyzing the total sample are consistent across age cohorts. Total hours of care, number of paid helpers, number of IADL impairments, and the number of unpaid ADL activities are positively related to the number of care-receiver ADL impairments. Only when the care-receiver is 65 to 74 is there a negative relationship between the number of unpaid helpers and the number of ADL impairments. Moreover, the negative indirect effect of number of unpaid helpers on ADL impairments, mediated by the number of IADL impairments, is greatest for those 65 to 74 and declines thereafter. The 65 to 74 age cohort has the fewest ADL impairments, but may very likely have the broadest range of family, friends, and neighbors available to provide unpaid assistance since they are less likely to have been uprooted from their homes. This finding supports Stoller and Earl's (1983) assertion that the willingness of neighbors and friends to provide intermittent assistance cannot be equated with the competence nor the ability to meet long-term care needs.

The positive indirect effect of total hours of care on ADL impairments, mediated by the number of IADL impairments, and the negative indirect effect of the number of unpaid ADL activities on ADL impairments, mediated by the number of unpaid helpers, are consistent across age stratified subsamples. The variance explained in the number of ADL impairments by these variables declines from 31.7 percent for those 65 to 74, to 27.4 percent for those 75 to 84, and 25.3 percent for those 85 and older.

Results of the sixth equation, number of care-receiver IADL impairments, are consistent across age cohorts with one exception. While total hours of care, number of paid helpers, and number of unpaid IADL activities are positively associated with the number of IADL impairments, the number of unpaid helpers and reciprocity are negatively related. Moreover, the negative indirect effects of the number of paid helpers on IADL impairments, mediated by the number of unpaid helpers, and the number of unpaid IADL activities on IADL impairments, mediated by the number of unpaid helpers, are consistent across age stratified subsamples.

Household size is not positively related to IADL impairments for those 65 to 74, in contrast to the other two age cohorts. The explanation lies in the fact that it is this age cohort for whom the primary caregiver is most likely to be a spouse. As noted earlier, primary caregivers who care for a spouse are more likely to care

for the care-receiver in all ways until their physical and emotional resources are exceeded. The importance of IADL impairments as the care-receiver ages is exemplified by the large differences in explained variance by age cohort. The variance in number of IADL impairments explained by the model declines from 48.2 percent for those 65 to 74, to 37.4 percent for those 75 to 84, and 16.9 percent for those 85 and older. As the care-receiver ages, ADL impairments overtake IADL impairments in importance and prevalence.

The seventh endogenous variable is self-perceived stress of the primary caregiver. Both the direct effect of caregiver burden and affection for the care-receiver by the primary caregiver are positively related to caregiver stress across age stratified subsamples. Nevertheless, there are some surprising differences. For example, contrary to expectations, total hours of care is negatively related to stress when the care-receiver is 75 to 84. However, for all age cohorts, there is a substantial positive indirect effect of total hours of care on primary caregiver stress mediated by primary caregiver burden. As suggested earlier, stress seems to be the result of increased burden, which in turn is influenced by the total hours of care.

The number of paid helpers is positively associated with self-perceived stress of the primary caregiver only when the care-receiver is 65 to 74. This is also the only subsample for which household income is positively related

to the number of paid helpers. Thus, it appears that while spouse primary caregivers are sometimes capable of purchasing paid assistance when the care-receiver is 65 to 74, it increases their level of stress. This conclusion corresponds with the idea that couples in this age cohort are more likely to be in the midst of "spending down" their income and assets in order to eventually qualify for Medicaid benefits (National Study Group on State Medicaid Strategies, 1983). Finally, the indirect effect of the number of paid helpers, mediated by the number of unpaid helpers, is negative for the 65 to 74 and 85 and older age cohorts, but positive when the care-receiver is 75 to 84.

The number of unpaid helpers is negatively related to stress for those 65 to 74, positively associated with stress for those 75 to 84, and nonsignificant when the care-receiver is 85 and older. Thus, spouse caregivers, more likely in the 65 to 74 age cohort, benefit from unpaid assistance due to its impact on stress. For primary caregivers of those 75 to 84, the increased household size and additional commitments that the presence of unpaid helpers means appears to add to their stress. The negative indirect effect of the number of unpaid helpers on primary caregiver stress, mediated by the number of care-receiver IADL impairments and primary caregiver burden, is consistent across age cohorts, but decreases in strength as the care-receiver ages. The variance explained in self-perceived primary caregiver stress is 9.1 percent, 5.7

percent, and 16.5 percent for those 65 to 74, 75 to 84, and 85 and older respectively.

Results of the eighth equation, primary caregiver burden, are different by age cohort. Total hours of care and the number of care-receiver IADL impairments are positively related to caregiver burden across age cohorts. Moreover, for all subsamples, when the caregiver and care-receiver share a residence, primary caregiver burden is increased. The positive indirect effect of total hours of care on caregiver burden, mediated by care-receiver IADL impairments, and the negative indirect effect of the number of unpaid helpers on caregiver burden, mediated by the number of IADL impairments, are also consistent.

On the other hand, the number of paid helpers is negatively related to primary caregiver burden only when the care-receiver is 85 and older. The likelihood that primary caregivers will have functional limitations of their own in this age cohort is increased. As a result, the ability to afford paid helpers or acquire them through Medicaid funding benefits the primary caregiver. Furthermore, although primary caregivers who are male feel less burden when the care-receiver is 65 to 74 or 75 to 84, there is no relationship when the care-receiver is 85 and older. The variance explained by these variables is 21.7 percent for those 65 to 74, 25.3 percent for those 75 to 84, and 22.4 percent for those 85 and older.

The significant relationships between endogenous variables described above for subsamples of care-receivers 65 to 74, 75 to 84, and 85 and older are depicted in Figures 7-1, 7-2, and 7-3 respectively. As before, the nature of the relationship is denoted by a plus or minus sign in parentheses above each line.

Discussion

The circumstances encountered when caring for the functionally limited elderly have been the focus of increased research in recent years. Yet, the difficulties associated with caregiving and the structure of caregiving networks capable of providing sufficient assistance at various stages have not been addressed. The present research analyzes a comprehensive model of the caregiving network by age of the care-receiver. As a result, it represents an initial effort to identify differences by age cohort rather than a test of well established conceptual relationships.

The shared functions conceptual approach, represented by the causal relationships between total hours of care, number of paid helpers, number of unpaid helpers, and antecedents to institutionalization, is supported by the data in all three age cohorts. Total hours of care and the number of paid helpers are positively associated with the number of ADL and IADL impairments across age stratified subsamples. On the other hand, consistent with the

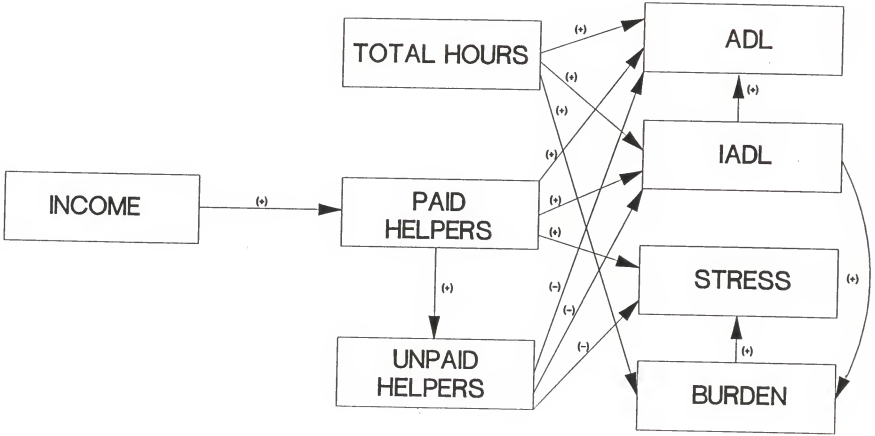

Figure 7-1: Significant Relationships Between Endogenous Variables: 65 to 74 Age Cohort

Note: Equations and results for these relationships are found in Tables 6-2 and 7-1.

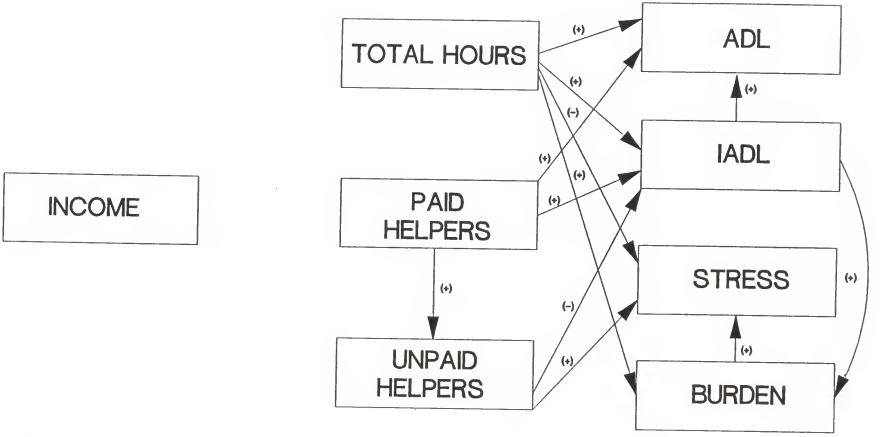

Figure 7-2: Significant Relationships Between Endogenous Variables: 75 to 84 Age Cohort

Note: Equations and results for these relationships are found in Tables 6-2 and 7-2.

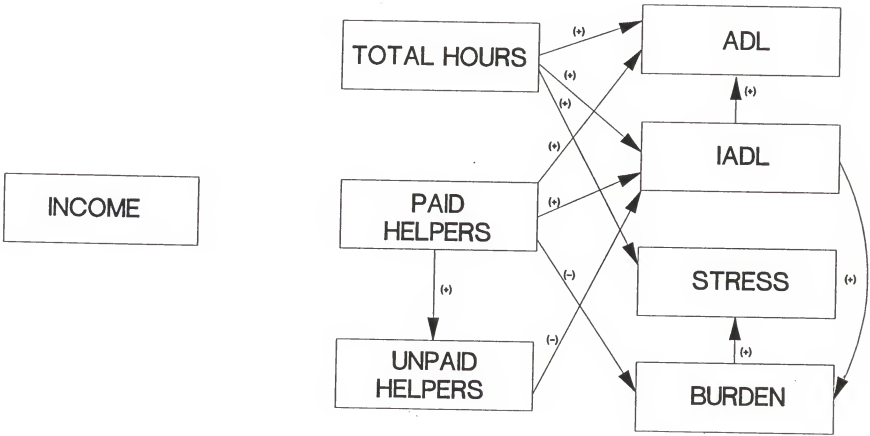

Figure 7-3: Significant Relationships Between Endogenous Variables: 85 and Older Age Cohort

Note: Equations and results for these relationships are found in Tables 6-2 and 7-3.

analysis of the total sample, the effect of the number of unpaid helpers on antecedents to institutionalization is varied.

The inconsistent role of unpaid helpers in the caregiving network, coupled with the earlier finding that the number of unpaid helpers declines as impairments increase, suggests that the informal network may represent the best opportunity for providing increased services to the functionally impaired elderly at minimal cost. The consistent link between the number of unpaid helpers and IADL impairments indicates that unpaid helpers could be trained to accomplish these more complex, yet intermittent tasks. Based on the present research, the specific result would be to decrease primary caregiver stress and burden, outcomes which are affected by increased IADL impairments. By one estimate, IADL impairments are a problem for up to 99 percent of the noninstitutionalized functionally limited elderly (Branch and Jette, 1983). The long-term effect would be to maintain an increasingly functionally impaired elderly person in the community longer than otherwise possible.

Household income is significantly associated with the number of paid helpers only for the 65 to 74 age cohort. This is interesting for two reasons. First, for elderly persons with multiple impairments, this is the period during which they are the most likely to be "spending down" their income and assets before qualifying for Medicaid.

Thus, while older care-receivers probably do not have a decreased need for paid assistance, they are more likely to receive benefits from the formal sector which cover such expenditures. Second, the presumed effect of privately paying for caregiving assistance is an increase in self-perceived primary caregiver stress. The 65 to 74 age cohort is the only subsample in which the number of paid helpers is positively related to caregiver stress. This relationship is likely to become more prevalent in subsequent years as results of the "out sooner and sicker" philosophy of government instituted DRG's and cuts in Medicare and Medicaid expenditures become more common (Select Committee on Aging, 1987b).

The weak negative relationship between total hours of care and the number of unpaid helpers, statistically significant when analyzing the total sample, is not significant in any of the age stratified subsamples. This shows that the earlier finding was significant primarily due to the very large sample size when analyzing the pooled data. The lack of a strong, consistent relationship between number of unpaid helpers and total hours of care supports the conclusion that Litwak's (1985) concept of functional substitutability is not applicable to the caregiving network. The input of the informal support network is not greatly influenced by the time investment of the primary caregiver.

Perhaps the most interesting outcome is that the 75 to 84 age cohort appears to have some unique characteristics. When there are differences by age cohort, the 75 to 84 age stratified subsample is most frequently at odds with the other two age groups. For example, male primary caregivers and spouses provide more total hours of care only when the care-receiver is 75 to 84, while the same is true for the positive relationships between household size, urbanness, and the number of unpaid helpers. Moreover, the effect of total hours of care and the number of unpaid helpers on self-perceived primary caregiver stress differs from the other two subsamples when the care-receiver is 75 to 84.

The most plausible explanation for this observation is that for caregiving relationships in general, the years when the care-receiver is 75 to 84 are the most likely to be years of transition because functional impairments are likely to mount. Furthermore, while a spouse has probably been the primary caregiver up until this time, the likelihood that he or she will die and be replaced by an adult-child with other commitments increases. As a result, unpaid helpers who can assist with specific tasks are potentially more important. Thus, policies that affect functionally limited elderly persons should consider the special circumstances experienced by the caregiving network when the care-receiver is 75 to 84.

Summary

The issue addressed in this chapter is whether or not the variance-covariance matrices differ, validating their analysis separately. The test of the equality hypothesis was rejected and the revised caregiving model was fit to each of three age cohorts. The results show that there are substantial differences in the caregiving network by age of the care-receiver. Specifically, unpaid helpers, the effect of household income on the number of paid helpers and ultimately on caregiver stress, and the unique characteristics of the 75 to 84 age cohort are important.

CHAPTER EIGHT
CONCLUSIONS

Recent economic analyses, research by social scientists, and government policy changes underscore the trend toward emphasizing family-based community care as a desirable alternative to institutionalization for the functionally limited elderly. This reshaping of public policy and popular opinion is occurring at a time when the ability of potential caregivers to provide caregiving services is affected by other social changes such as increased marital disruption and female labor force participation. Moreover, the size of the aged population and the number of functionally limited elderly persons are expected to increase at greater rates than ever before. Inasmuch as families are expected to provide extended levels of care to a growing population of disabled elderly persons, their ability to withstand these mounting responsibilities is in question.

The intent of this research has been to address the extent to which there are age-linked dissimilarities in the caregiving network. This is an important topic because, although heterogeneity among elderly persons 65 and older and among family caregivers has recently been acknowledged in a limited fashion, academic research is conducted and

policies are implemented which treat the aged population as a homogeneous group. If families are to become responsible for the care of the functionally limited elderly in increased numbers, then research and policies must recognize that the needs of the disabled elderly and of their caregiving networks are different and that one way to assess these dissimilarities is by age of the care-receiver.

Long-term care options for the impaired elderly are not limited to the dichotomy of family-based care and institutionalization. Litwak (1970; 1985) contends that the needs of both family systems and bureaucracies are best served through balanced cooperation. Thus, throughout this research, the separate roles of the primary caregiver, the formal support network, and the informal support network have been underscored.

Three questions have been specifically addressed in this research. First, do characteristics of functionally impaired elderly persons and their caregiving network differ by age of the care-receiver? Second, can a theoretical model be derived from the caregiving literature and adequately fit to the data? Third, are there differences in age stratified samples of the functionally limited elderly and, if so, do these differences extend to the nature of specific caregiving relationships? The effort to answer these questions contributes to the caregiving literature by delineating age-linked

dissimilarities which are important for the development of future research and policymaking.

Results show that there are differences in the caregiving network by age of the care-receiver that are masked or distorted when analyzing the model with pooled data. These dissimilarities should be formally considered when formulating policies, conducting research, and designing intervention strategies that affect the functionally limited elderly and their caregiving network.

Despite general support for the hypotheses that orient this study, several caveats should be carefully considered when planning future research. First, these data are cross-sectional rather than longitudinal. Although the acquisition of longitudinal data is difficult and expensive, it would be useful to compare changes in the caregiving network over time for a consistent sample of elderly individuals. Second, the data are largely self-reported. Thus, for variables such as total hours of care, it is impossible to know what activities are included in the respondent's assessment of time spent providing caregiving services. Third, several important variables in this data set are categorical rather than continuous. As a result, variables such as length of paid and unpaid caregiving are approximations when summed across the number of helpers. Fourth, the data used in this research are unique. While all elderly persons in this sample have at least one ADL impairment, this is true for only 14 percent

of those 65 to 74 and 18 percent of those 85 and older in the general population (Health Care Financing Administration, 1981). Finally, the results relative to primary caregiver stress and burden should be cautiously considered. The measurement of these concepts with single item self-report indicators is problematic because little is known about the points of reference used by the caregiver to make these subjective judgements.

Future research would benefit from the use of diaries for gathering specific task-related information rather than relying on the retrospective summary self-reports of primary caregivers. This approach would allow the researcher to more clearly delineate between caregiving and noncaregiving related tasks. The minimal variance explained in total hours of care by variables previously identified in the caregiving literature suggests that more research is needed to determine what factors influence the amount of care provided by primary caregivers. In addition, the role of unpaid helpers in maintaining functionally limited elderly persons in the community has been questioned. Future studies should focus on the conditions under which unpaid helpers provide ADL and IADL support. Finally, additional research should be conducted to explore the caregiving environment experienced by primary caregivers who care for two functionally limited elderly persons. This appears to be a subgroup at great risk.

The revised model of the caregiving network analyzed in this research supports Litwak's assertion that the elderly can best be cared for through balanced cooperation. Although the "theory of shared functions" is based on two components, the formal sector and primary groups, the model of the caregiving network expands these concepts to include the primary caregiver, the formal network, and the informal network. When analyzing the total sample, and age cohorts separately, the primary caregiver and formal support network components are factors in predicting ADL or IADL impairments. Thus, increases in the total hours of care and number of paid helpers are commensurate with the maintenance of an increasingly impaired elderly person in the community. Surprisingly, the number of unpaid helpers is negatively related to functional impairments of the care-receiver. Results indicate that when the functional limitations of the elderly in this sample increase, fewer unpaid helpers provide an expanded array of services.

The foregoing analysis suggests that the concept of functional substitutability (Litwak, 1985) is not indicative of the way that the formal and informal networks operate to insure the fulfillment of tasks necessary to avoid institutionalization. For example, there is a positive relationship between paid helpers and unpaid helpers across age cohorts such that the greater the paid helpers, the greater the unpaid helpers. The optimal sharing of functions approach, in which family and informal

systems address socioemotional needs while bureaucracies concentrate on routinized tasks, suggests that a negative relationship is to be expected. Relative to caregiving, this finding suggests that a combination of resources is utilized to maintain an impaired elderly person in the community. Previous research has shown that one role of unpaid helpers is to "pilot" the elderly person through the maze of available formal services (Streib, 1983; Fengler and Goodrich, 1979).

Many of the findings in this research support the work of others. For example, older women are more likely to live alone and men are more likely to receive outside sources of assistance (Health Care Financing Administration, 1981; Johnson and Catalano, 1983). On the other hand, the number of primary caregivers whose employment is affected by providing caregiver services is far less than found by Brody (1985). Moreover, stress does not seem to be a factor in initiating the use of home-care services as suggested by Bass and Noelker (1987).

Beyond the conceptual framework and general questions that orient this research, there are several important findings that add significantly to the research on caregiving. Hooyman et al. (1985) conclude that primary caregivers and families are providing all the care they are willing and able to give. It is also apparent that the ability of the formal sector to provide adequate funding is declining. This research supports these conclusions, but

suggests that the informal network might be utilized to provide additional care with a minimum of resources. As the number of functional impairments increases, the number of unpaid helpers declines. This is apparently due to the inability of such persons to assist with more complex IADL limitations, impairments which also contribute to the subjective burden and self-perceived stress of primary caregivers. If unpaid helpers could be trained to perform specific IADL tasks, which are needed more intermittently than ADL tasks, then informal helpers could participate in the maintenance of the functionally impaired elderly in the community in greater numbers.

Of great concern is that, in a sample of functionally impaired elderly persons, substantial numbers of impaired elderly persons who are married are not cared for by their spouse. The implication is that nonspouse primary caregivers, usually adult-child daughters, are providing extensive caregiving services to two functionally impaired elderly persons. This result has not been noted in previous research, but suggests that a small percentage of primary caregivers deal with caregiving situations more complicated and difficult than formerly acknowledged in the literature.

Household income is not a major factor influencing the ability of caregiving components to assist with care-receiver functional impairments and mediate caregiver stress and burden as had been expected. Only when the

care-receiver is 65 to 74 is household income positively related to the number of paid helpers. This finding is probably due to the "spend down" phenomenon common among care-receivers who have too much income or assets to qualify for Medicaid benefits, but not enough to provide for adequate in-home care or institutionalization when necessary. Policy changes should be made in the Medicaid program to facilitate more than the current 1.7 percent expenditure on home health care (Select Committee on Aging, 1987a).

Interestingly, results from this research suggest that primary caregiver stress, although it may be a symptom of other complications in the caregiving network, has little influence on other antecedents to institutionalization. However, caregiver burden is an important component of the caregiving network. Future research on caregiving should make use of a measure of the subjective assessment of burden felt by the primary caregiver rather than of self-perceived primary caregiver stress because it is more closely linked to other components of the caregiving network. Moreover, the consistent and positive relationship between affection and stress across age cohorts suggests that obligation and demographic factors may be more important predictors of primary caregivers' motivation to provide helping services (Ikels, 1983; Cicerelli, 1983; Jarrett, 1985).

Results from the analysis of the caregiving network by age cohort suggest that when the care-receiver is 75 to 84, the caregiving network may be particularly vulnerable. During this period the primary caregiver is more likely to become an adult-child with many other commitments such as children or grandchildren of his or her own. Moreover, the functional limitations of the care-receiver will increase. Intervention strategies in particular should be designed so that they are more sensitive to this somewhat more tenuous caregiving environment.

The most general observation is that research agendas, government policymakers, and individuals who design intervention strategies should be aware of the numerous differences in the caregiving network by age of the care-receiver. With limited financial and physical resources available, difficult decisions must be made in order to prepare for the vast growth in the number of functionally limited elderly persons in this country over the next four decades. Although two possibilities have been suggested, an increased emphasis on the ability of the informal network to provide specific functional tasks and increased use of Medicaid to provide home-care services, more research is needed to better understand the relationships addressed in this research. Finally, these findings support the assertion that the impaired elderly and their caregiving network should be addressed as a heterogenous rather than a homogeneous group.

APPENDIX A
MEANS AND STANDARD DEVIATIONS FOR ALL VARIABLES

Characteristics	Total	65-74	75-84	85+
Care-receiver Gender	0.399 (0.490)	0.468 (0.499)	0.393 (0.489)	0.273 (0.446)
Care-receiver Race	0.129 (0.335)	0.149 (0.356)	0.098 (0.297)	0.145 (0.353)
Marital Status	0.717 (0.450)	0.776 (0.418)	0.720 (0.449)	0.599 (0.491)
Living Arrangement	0.808 (0.394)	0.846 (0.361)	0.793 (0.406)	0.761 (0.427)
Urbanness	3.445 (1.489)	3.349 (1.518)	3.440 (1.474)	3.636 (1.443)
Income	12789.97 (9821.38)	11556.91 (7915.27)	12944.44 (9991.86)	15006.17 (12314.36)
Medicaid	0.216 (0.412)	0.202 (0.402)	0.211 (0.409)	0.253 (0.435)
ADL Impairments	3.589 (1.942)	3.416 (1.944)	3.630 (1.909)	3.855 (1.965)
IADL Impairments	5.973 (2.384)	5.358 (2.477)	6.233 (2.297)	6.724 (2.028)
Caregiver Gender	0.273 (0.446)	0.356 (0.479)	0.233 (0.423)	0.182 (0.386)
Caregiver Race	0.131 (0.338)	0.154 (0.361)	0.096 (0.295)	0.148 (0.356)
Relationship	0.453 (0.498)	0.639 (0.481)	0.413 (0.493)	0.158 (0.366)
Age of Caregiver	61.86 (15.04)	61.13 (15.59)	62.16 (15.55)	62.78 (12.86)

APPENDIX A--continued

Characteristics	Total	65-74	75-84	85+
Employment	1.527 (0.962)	1.513 (0.955)	1.505 (0.937)	1.593 (1.016)
Length	6.857 (6.496)	7.396 (7.149)	6.275 (5.938)	6.813 (5.991)
Hours of Care	4.470 (4.851)	4.310 (4.739)	4.463 (4.854)	4.797 (5.062)
Affection	6.216 (2.040)	6.192 (2.009)	6.178 (2.109)	6.329 (1.979)
Stress	4.705 (2.030)	4.511 (2.194)	4.759 (1.846)	4.994 (1.959)
Functional Impairments	0.120 (0.787)	0.221 (0.791)	0.188 (0.790)	0.179 (0.775)
Subjective Health	2.729 (0.901)	2.636 (0.932)	2.806 (0.854)	2.778 (0.903)
Burden	2.896 (2.379)	2.492 (2.280)	3.162 (2.403)	3.222 (2.420)
Household Size	2.485 (1.246)	2.361 (1.149)	2.511 (1.283)	2.680 (1.334)
Number of Children	2.324 (2.173)	2.475 (2.270)	2.237 (2.137)	2.182 (2.027)
Number of Helpers	2.214 (1.328)	2.109 (1.383)	2.260 (1.274)	2.340 (1.295)
Reciprocity	2.053 (1.164)	2.204 (1.127)	2.025 (1.207)	1.808 (1.118)
Relative's Visits	3.094 (1.545)	3.155 (1.488)	3.097 (1.551)	2.966 (1.577)
Relative's Calls	2.773 (1.591)	3.026 (1.571)	2.768 (1.597)	2.261 (1.499)
Friend's Visits	2.898 (1.479)	3.137 (1.488)	2.758 (1.490)	2.607 (1.345)
Friend's Calls	2.379 (1.482)	2.647 (1.459)	2.260 (1.508)	1.979 (1.365)

APPENDIX A--continued

Characteristics	Total	65-74	75-84	85+
Informal Length	7.291 (4.928)	6.952 (5.004)	7.401 (4.811)	7.764 (4.946)
Days Helping	8.965 (5.196)	8.342 (5.127)	9.194 (5.047)	9.788 (5.447)
Number of ADL Tasks	1.453 (0.923)	1.387 (0.909)	1.466 (0.900)	1.559 (0.982)
Number of IADL Tasks	6.326 (3.580)	5.620 (3.361)	6.646 (3.369)	7.152 (4.070)
Paid Length	0.750 (1.821)	0.677 (1.732)	0.748 (1.862)	0.896 (1.914)
Number of Paid Days	0.660 (1.863)	0.608 (1.791)	0.618 (1.804)	0.832 (2.084)
Number of Paid Helpers	0.261 (0.587)	0.249 (0.561)	0.256 (0.622)	0.293 (0.574)
Paid ADL Tasks	0.126 (0.405)	0.104 (0.352)	0.133 (0.449)	0.158 (0.417)
Paid IADL Tasks	0.388 (1.161)	0.342 (0.992)	0.382 (1.298)	0.488 (1.214)
N =	1387	579	511	297

APPENDIX B
INDIRECT EFFECTS FOR VARIABLES IN SIMULTANEOUS EQUATIONS: TOTAL SAMPLE

	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
y_1	--	.000	.000	.011	--	--	-	--
y_2	--	--	.000	-.006	.210	-.006	.767	.119
y_3	--	--	--	.000	-.018	-.675	-.025	.080
y_4	--	--	--	--	-.219	.019	-.089	-.128
y_5	--	--	--	--	--	.001	--	--
y_6	--	--	--	--	-.007	--	--	-.004
y_7	--	--	--	--	--	--	--	--
y_8	--	--	--	--	--	--	.000	--
x_1	.000	--	--	--	--	--	--	--
x_2	.000	--	--	--	--	--	--	--
x_3	--	.000	--	--	--	--	--	.075
x_4	--	.000	--	--	--	--	--	--
x_5	--	.000	--	--	--	--	--	.051
x_6	--	.000	--	--	--	--	--	--
x_7	--	.000	--	--	--	--	--	--
x_8	--	.000	--	--	--	--	--	.055
x_9	--	.000	--	.002	--	--	--	--
x_{10}	--	.000	--	--	--	--	.019	--
x_{11}	--	.000	--	--	--	--	--	--
x_{12}	--	.000	--	--	--	--	--	-.043

APPENDIX B--continued

	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
x_{13}	--	--	.000	--	--	--	--	--
x_{14}	--	--	.000	--	--	--	--	--
x_{15}	--	--	.000	--	--	--	--	--
x_{16}	--	--	.000	--	--	--	--	--
x_{17}	.000	--	--	-.002	--	-.009	--	--
x_{18}	--	--	--	.000	--	--	--	--
x_{19}	--	.000	--	.004	--	-.026	--	-.142
x_{20}	.000	--	--	-.001	--	--	--	--
x_{21}	--	--	--	.000	--	--	--	--
x_{22}	--	--	--	.000	--	--	--	--
x_{23}	--	--	--	.000	--	--	--	--
x_{24}	--	--	--	.000	--	--	--	--
x_{25}	--	--	--	.000	--	--	--	--
x_{26}	--	--	--	.000	--	--	--	--
x_{27}	--	--	--	.000	--	-.289	--	--
x_{28}	--	--	--	.000	-.134	--	--	--

APPENDIX C
INDIRECT EFFECTS FOR VARIABLES IN SIMULTANEOUS EQUATIONS: 65 TO 74 AGE COHORT

	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
y_1	--	.000	.000	.057	--	--	-	--
y_2	--	--	.000	-.009	.270	.050	.826	.131
y_3	--	--	--	.000	-.053	-.764	-.192	.065
y_4	--	--	--	--	-.257	-.004	-.119	-.129
y_5	--	--	--	--	--	.000	--	--
y_6	--	--	--	--	.001	--	--	-.000
y_7	--	--	--	--	--	--	--	--
y_8	--	--	--	--	--	--	.000	--
x_1	.000	--	--	--	--	--	--	--
x_2	.000	--	--	--	--	--	--	--
x_3	--	.000	--	--	--	--	--	.046
x_4	--	.000	--	--	--	--	--	--
x_5	--	.000	--	--	--	--	--	.070
x_6	--	.000	--	--	--	--	--	--
x_7	--	.000	--	--	--	--	--	--
x_8	--	.000	--	--	--	--	--	.006
x_9	--	.000	--	.003	--	--	--	--
x_{10}	--	.000	--	--	--	--	.014	--
x_{11}	--	.000	--	--	--	--	--	--
x_{12}	--	.000	--	--	--	--	--	-.018

APPENDIX C--continued

	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
x_{13}	--	--	.000	--	--	--	--	--
x_{14}	--	--	.000	--	--	--	--	--
x_{15}	--	--	.000	--	--	--	--	--
x_{16}	--	--	.000	--	--	--	--	--
x_{17}	.000	--	--	.001	--	.011	--	--
x_{18}	--	--	--	.000	--	--	--	--
x_{19}	--	.000	--	.003	--	-.039	--	-.108
x_{20}	.000	--	--	.001	--	--	--	--
x_{21}	--	--	--	.001	--	--	--	--
x_{22}	--	--	--	.000	--	--	--	--
x_{23}	--	--	--	.000	--	--	--	--
x_{24}	--	--	--	.000	--	--	--	--
x_{25}	--	--	--	.000	--	--	--	--
x_{26}	--	--	--	.000	--	--	--	--
x_{27}	--	--	--	.000	--	-.243	--	--
x_{28}	--	--	--	.000	-.213	--	--	--

APPENDIX D
INDIRECT EFFECTS FOR VARIABLES IN SIMULTANEOUS EQUATIONS: 75 TO 84 AGE COHORT

	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
y_1	--	.000	.000	-.025	--	--	-	--
y_2	--	--	.000	.005	.135	.006	.873	.074
y_3	--	--	--	.000	-.037	-.617	.225	.017
y_4	--	--	--	--	-.203	.013	-.097	-.114
y_5	--	--	--	--	--	.000	--	--
y_6	--	--	--	--	-.005	--	--	-.003
y_7	--	--	--	--	--	--	--	--
y_8	--	--	--	--	--	--	.000	--
x_1	.000	--	--	--	--	--	--	--
x_2	.000	--	--	--	--	--	--	--
x_3	--	.000	--	--	--	--	--	.190
x_4	--	.000	--	--	--	--	--	--
x_5	--	.000	--	--	--	--	--	-.006
x_6	--	.000	--	--	--	--	--	--
x_7	--	.000	--	--	--	--	--	--
x_8	--	.000	--	--	--	--	--	.134
x_9	--	.000	--	-.002	--	--	--	--
x_{10}	--	.000	--	--	--	--	.014	--
x_{11}	--	.000	--	--	--	--	--	--
x_{12}	--	.000	--	--	--	--	--	-.057

APPENDIX D--continued

	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
x_{13}	--	--	.000	--	--	--	--	--
x_{14}	--	--	.000	--	--	--	--	--
x_{15}	--	--	.000	--	--	--	--	--
x_{16}	--	--	.000	--	--	--	--	--
x_{17}	.000	--	--	.000	--	-.012	--	--
x_{18}	--	--	--	.000	--	--	--	--
x_{19}	--	.000	--	.002	--	-.014	--	-.123
x_{20}	.000	--	--	.000	--	--	--	--
x_{21}	--	--	--	.000	--	--	--	--
x_{22}	--	--	--	.000	--	--	--	--
x_{23}	--	--	--	.000	--	--	--	--
x_{24}	--	--	--	.000	--	--	--	--
x_{25}	--	--	--	.000	--	--	--	--
x_{26}	--	--	--	.000	--	--	--	--
x_{27}	--	--	--	.000	--	-.224	--	--
x_{28}	--	--	--	.000	-.101	--	--	--

APPENDIX E

INDIRECT EFFECTS FOR VARIABLES IN SIMULTANEOUS EQUATIONS: 85 AND OLDER AGE COHORT

	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8
Y_1	--	.000	.000	.000	--	--	-	--
Y_2	--	--	.000	-.010	.251	-.105	.564	.149
Y_3	--	--	--	.000	.026	-.546	-.227	.064
Y_4	--	--	--	--	-.178	.032	-.056	-.102
Y_5	--	--	--	--	--	.006	--	--
Y_6	--	--	--	--	-.021	--	--	-.012
Y_7	--	--	--	--	--	--	--	--
Y_8	--	--	--	--	--	--	.000	--
X_1	.000	--	--	--	--	--	--	--
X_2	.000	--	--	--	--	--	--	--
X_3	--	.000	--	--	--	--	--	-.017
X_4	--	.000	--	--	--	--	--	--
X_5	--	.000	--	--	--	--	--	.050
X_6	--	.000	--	--	--	--	--	--
X_7	--	.000	--	--	--	--	--	--
X_8	--	.000	--	--	--	--	--	.061
X_9	--	.000	--	.003	--	--	--	--
X_{10}	--	.000	--	--	--	--	.026	--
X_{11}	--	.000	--	--	--	--	--	--
X_{12}	--	.000	--	--	--	--	--	-.073

APPENDIX E--continued

	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
x_{13}	--	--	.000	--	--	--	--	--
x_{14}	--	--	.000	--	--	--	--	--
x_{15}	--	--	.000	--	--	--	--	--
x_{16}	--	--	.000	--	--	--	--	--
x_{17}	.000	--	--	-.009	--	-.023	--	--
x_{18}	--	--	--	.000	--	--	--	--
x_{19}	--	.000	--	.004	--	-.027	--	-.175
x_{20}	.000	--	--	-.002	--	--	--	--
x_{21}	--	--	--	.000	--	--	--	--
x_{22}	--	--	--	.000	--	--	--	--
x_{23}	--	--	--	.000	--	--	--	--
x_{24}	--	--	--	.000	--	--	--	--
x_{25}	--	--	--	.000	--	--	--	--
x_{26}	--	--	--	.000	--	--	--	--
x_{27}	--	--	--	.000	--	-.284	--	--
x_{28}	--	--	--	.000	-.079	--	--	--

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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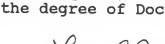

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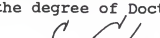

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This dissertation was submitted to the Graduate Faculty of the Department of Sociology in the College of Liberal Arts and Sciences and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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